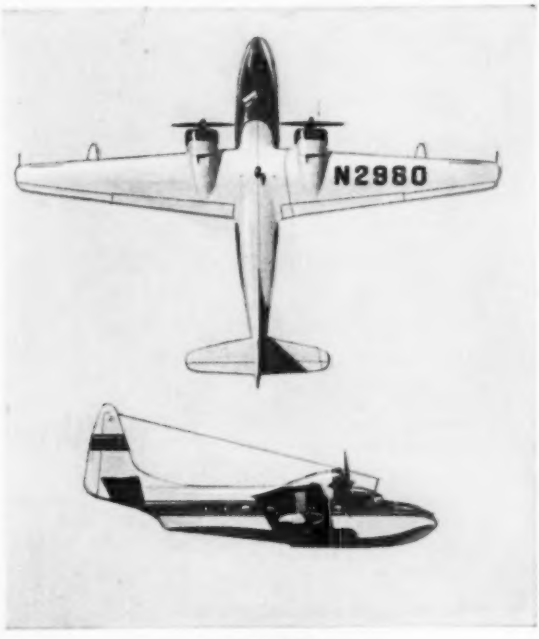
AVIATION WEEK

JUNE 14, 1954

50 CENTS

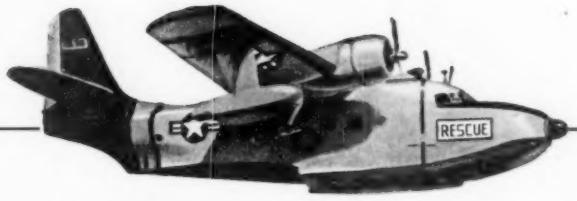
A McGRAW-HILL PUBLICATION

WIDGEON



MALLARD

ALBATROSS



Grumman

KNOWN FROM DJIBOUTI TO NARSARSSUAK

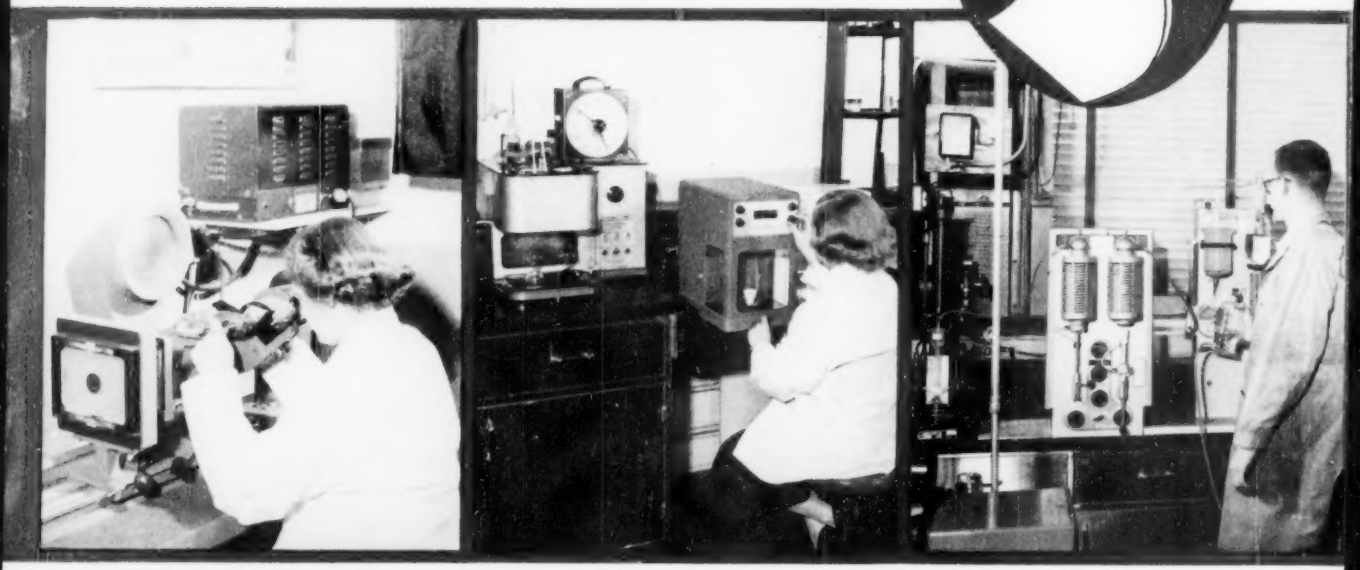
Like the five place Widgeon, the executive transport, the Mallard, is in service with companies and private owners throughout the world. The present production amphibian, the Grumman Albatross, is in global operations with the USAF Air Rescue Services, the Navy, and the Coast Guard. All told, Grumman has built more amphibians than any other company in the world.

GRUMMAN AIRCRAFT ENGINEERING CORPORATION BETHPAGE • LONG ISLAND • NEW YORK

DESIGNERS AND BUILDERS ALSO OF THE COUGAR JET FIGHTER, S2F-1 SUB-KILLER, METAL BOATS, AND AEROBILT TRUCK BODIES

400 CPS ±¼% regulation, long life, lightweight compactness result from material control like this...

SUNDSTRAND

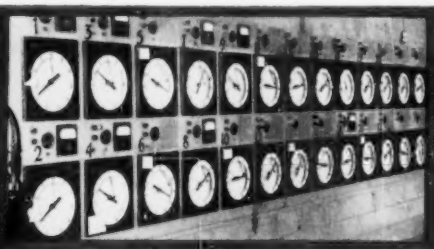


Metallograph permits microscopic examination of metals used in, or proposed for, Constant Speed Drive parts. Photomicrographs provide permanent records.

Automatic Balance weights items to fourth decimal point, within ±.05 mg. Used in quantitative analysis of materials.

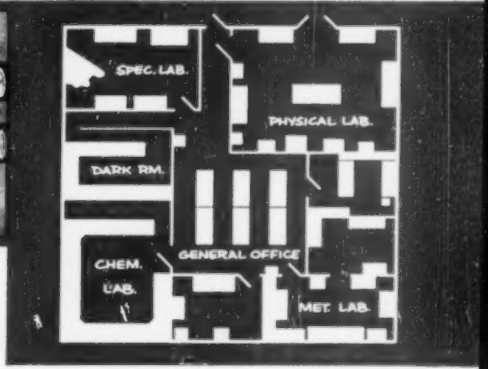
High-Frequency Induction Furnace—with temperature capacity of 3500° F—aids chemists in determining carbon and sulphur content of metals.

Spectrophotometer measures, with monochromatic light, transmittance of solutions of metals to determine quantities of various elements present.



(Above)—Instruments control and record performance of 26 heat treating furnaces.

(Right)—Layout of expanded lab, with modern facilities to test metals, rubber compounds, oils in temperature range of −85° to +500° F.



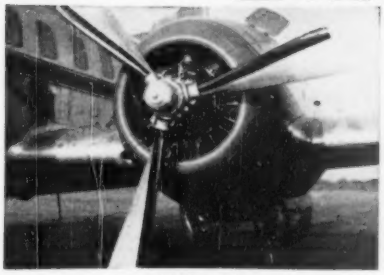
Facilities like these, devoted to material control and to research, have contributed much to the development of the Sundstrand Constant Speed Drive. Lightweight, compact, long-life Sundstrand Drives regulate alternator frequency to 400 CPS ±¼% . . . permit parallel operation—automatically—with load division within ±2 kw . . . with an input speed ratio of 3:1 or more. Call on us for help on a-c power generation problems.

SUNDSTRAND AVIATION

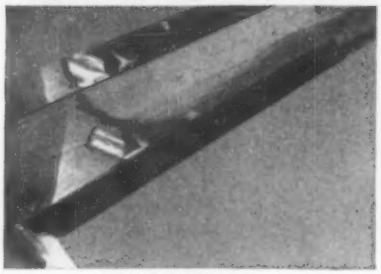
Division of Sundstrand Machine Tool Company, ROCKFORD, ILLINOIS • Western District Office: Hawthorne, California

CONSTANT SPEED DRIVES · AIRCRAFT ACCESSORIES

RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER

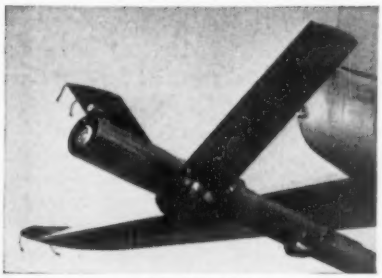


PROPELLER

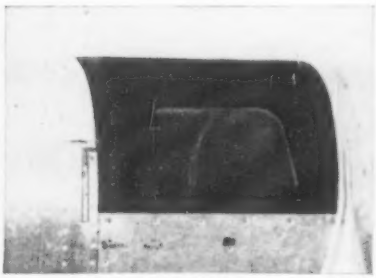


STABILIZER

MAST

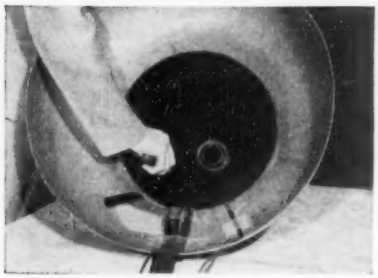


RUDDEVATOR

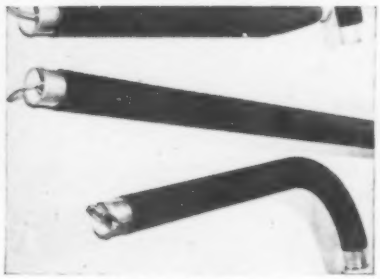


AIR SCOOP

ENGINE INTAKE



DIFFUSION COWL



OIL AND WATER LINES

HYDRAULIC ACCUMULATOR

How to keep planes from coming down with the cold

B. F. Goodrich electrically heated rubber supplies complete protection against ice and cold—even when the size and shape of the part may make it seem impossible. That's because B. F. Goodrich engineers can design heated rubber to fit skin-tight around the trickiest curves and corners.

A core of electric resistance wires sandwiched in the rubber supplies heat two ways: (1) either in cycles to loosen ice so the airstream can carry it away, or (2) constantly, to keep ice from forming in the first place.

Shown are nine of the many B. F. Goodrich heated rubber applications:

Heated rubber keeps leading edges ice-free. On propellers, it prevents ice from reducing flying speed; on stabilizers, it assures safe control; on masts, it eliminates chance of snapping; on ruddevators, it permits accurate control of Flying Boom for in-flight refueling.

Heated rubber keeps ice from choking vital air intakes. On air scoops, jet engine intakes and diffusion cowls, it insures plentiful air supply.

Heated rubber keeps parts operating at top efficiency. On oil and water lines, hydraulic accumulators, it provides correct operating temperatures.

B. F. Goodrich electrically heated rubber can be made as thin as .040" for protected locations, and .060" for external use. It simplifies design, saves weight, can be cemented right onto the part. It's another exclusive development of B. F. Goodrich engineering and research for aviation. Other B. F. Goodrich aviation products: tires, wheels, brakes; De-Icers; Avtrim; inflatable seals; fuel cells; Rivnuts; accessories. Write: *The B. F. Goodrich Co., Aeronautical Sales, Akron, Ohio.*

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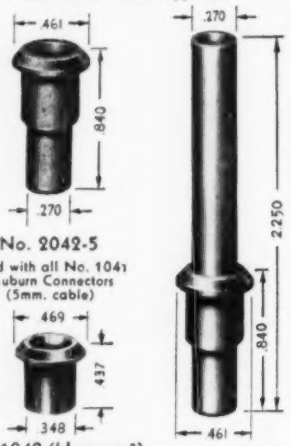
FIRST IN RUBBER

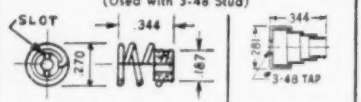
Auburn
IGNITION ACCESSORIES

Terminal Collars (Seals)
Ozone Resistant Hypreen*



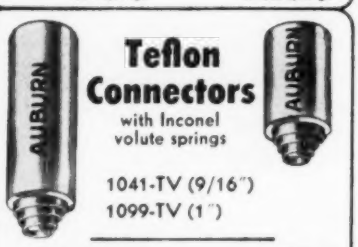
*Auburn Synthetic Rubber

SPRING AND EYELET ASSEMBLIES
(Used with 3-48 Stud)



No. 1066-9A (AN 4164-22) with stainless steel coil springs

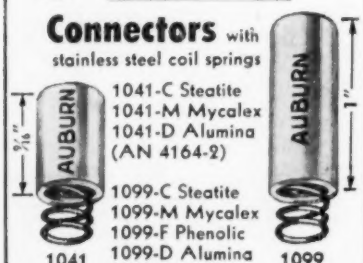
No. 1066-9V with Inconel volute springs



Teflon Connectors
with Inconel volute springs

1041-TV (9/16")
1099-TV (1")

Connectors with stainless steel coil springs



1041-C Steatite
1041-M Mycalex
1041-D Alumina
(AN 4164-2)

1041

1099-C Steatite
1099-M Mycalex
1099-F Phenolic
1099-D Alumina
(AN 4164-1)

1099

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Table of Contents on Page 8

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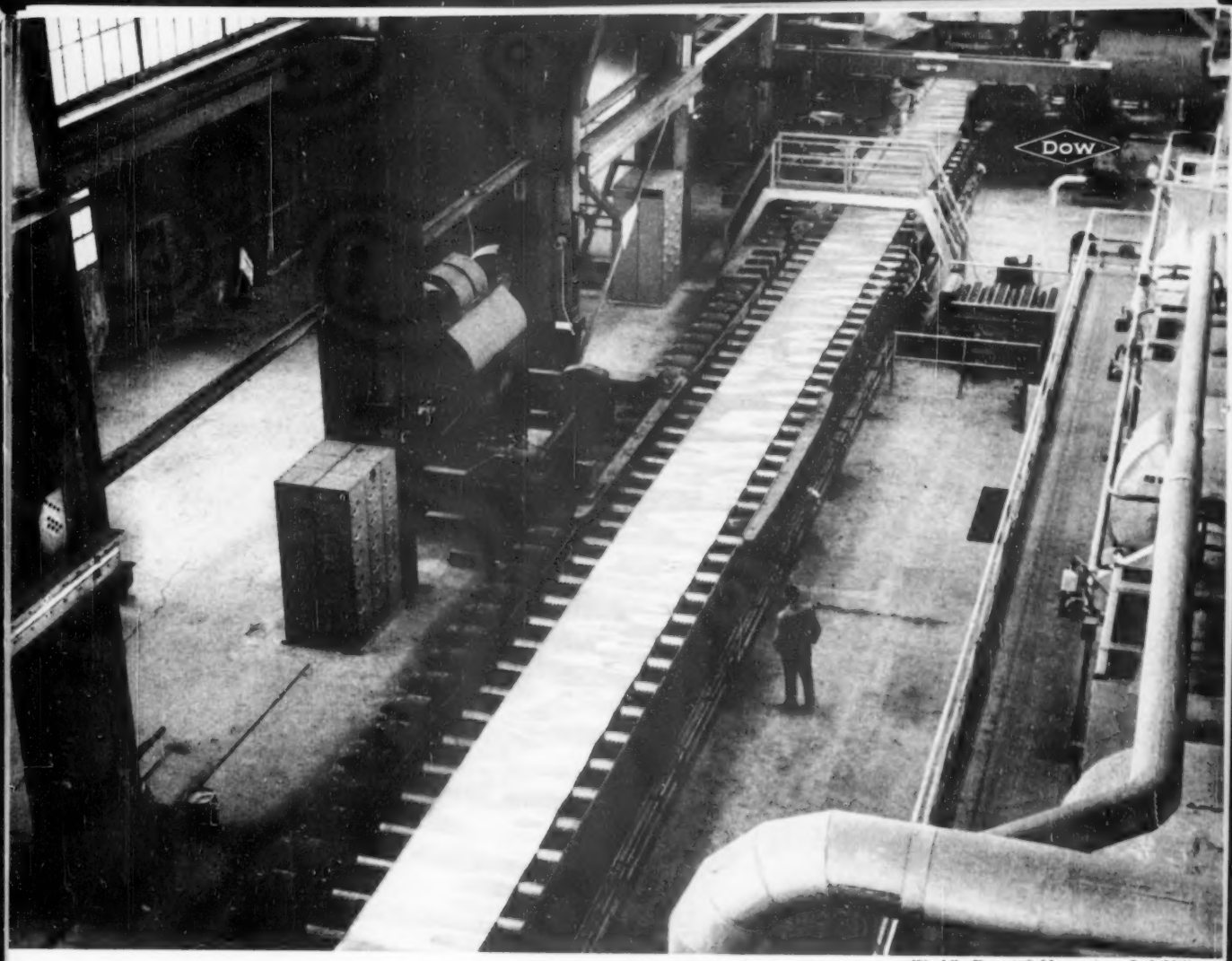


World's First 84" Magnesium Coil Mill.

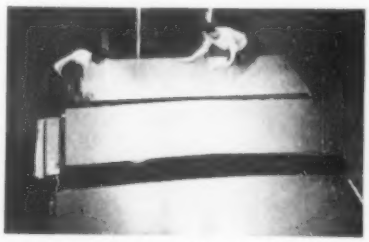
a new look at Magnesium!

UP TO 25% PRICE REDUCTION ON SHEET AND PLATE

New Dow facilities—now in operation—are producing magnesium sheet in *quantity*. Wider, longer—magnesium sheet now offers a brand new challenge to designers, engineers, manufacturers. To cut costs, to save weight, to add strength—to do revolutionary new things for many products—get the new magnesium story! Call the nearest Dow sales office or write THE DOW CHEMICAL COMPANY, Magnesium Department, Midland, Michigan.

Here for the first time, large magnesium rolling ingots weighing nearly a ton are being rolled.

Specially designed, carefully controlled ovens pre-heat huge magnesium ingots just before rolling.

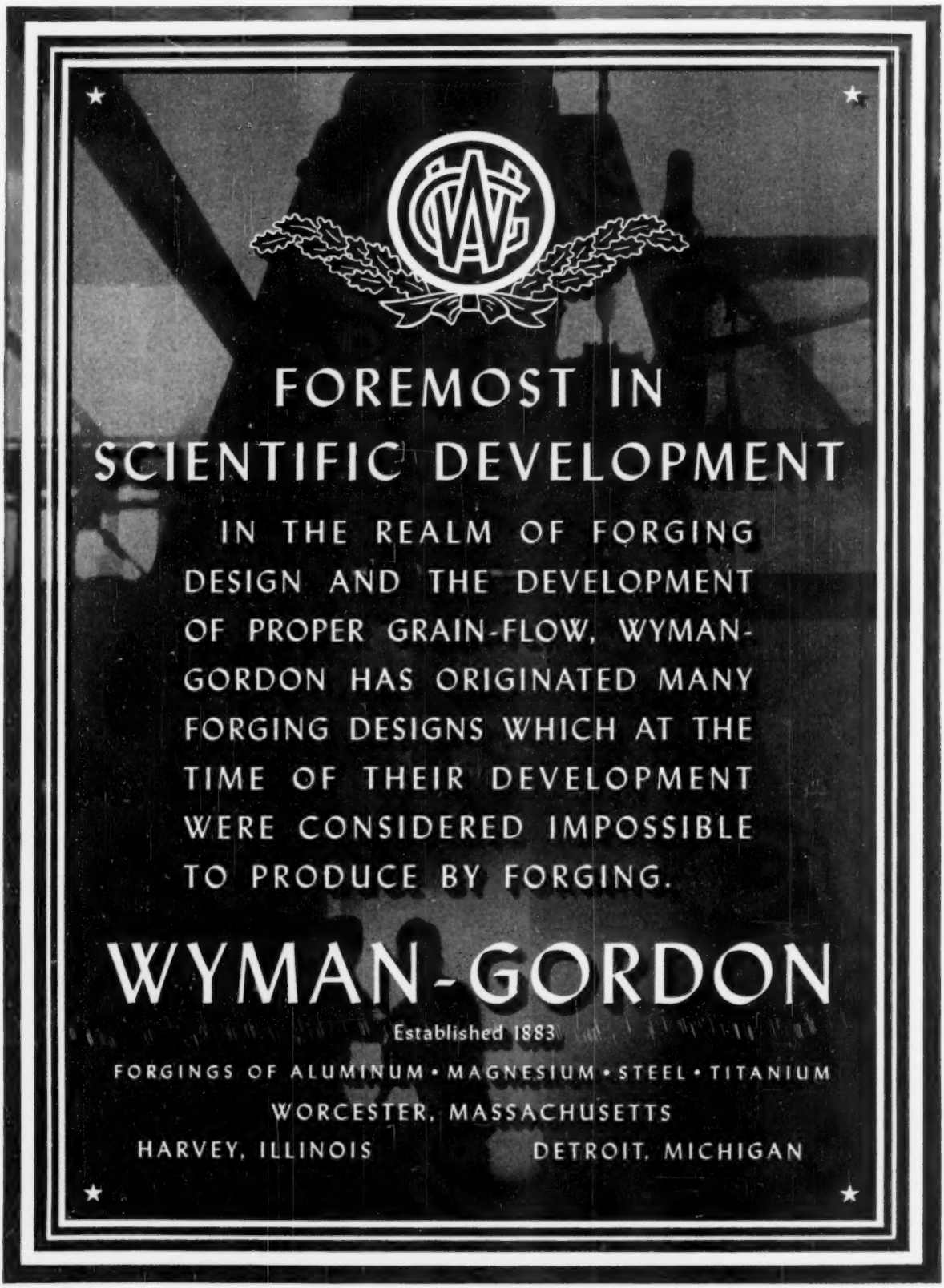


Constant inspection plus rigid production controls assure uniform magnesium sheet quality.

Note how coil of magnesium sheet illustrates new availability in greater widths and lengths.

you can depend on DOW MAGNESIUM

DOW


FOREMOST IN
SCIENTIFIC DEVELOPMENT
IN THE REALM OF FORGING DESIGN AND THE DEVELOPMENT OF PROPER GRAIN-FLOW, WYMAN-GORDON HAS ORIGINATED MANY FORGING DESIGNS WHICH AT THE TIME OF THEIR DEVELOPMENT WERE CONSIDERED IMPOSSIBLE TO PRODUCE BY FORGING.
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NEWS DIGEST

Domestic

Senate Appropriations Committee last week approved $40 million for Civil Aeronautics Board airline subsidies. The sum is $33 million less than asked by CAB and duplicates House action on the request. The committee said the $40 million is adequate to meet subsidy payments to Feb. 1, 1955. It directed the Board to "undertake a complete review of subsidy payments immediately" and report to the committee not later than January 1955.

Administration has asked Congress for $22 million in airport aid for fiscal 1955. This is $11 million less than the Commerce Department request to the Budget Bureau. Sen. Pat McCarran says the new request is "thoroughly inadequate to meet urgent requirements" and adds that he will fight for additional funds.

New turbine engine will be developed by Avco Manufacturing Corp.'s Lycoming Division under an Air Force contract. The powerplant project, second undertaken by Lycoming for USAF, will be centered at the Stratford, Conn., plant under the direction of Dr. Anselm Franz, vice president-turbine engineering and designer of the world's first mass-produced aircraft turbojet.

Aerobee sounding rocket reached an altitude of 90 mi. during tests at White Sands Proving Grounds, N. M., Aerojet-General Corp. reports. The builder says it is conducting a program to extend the rocket's altitude "considerably above" 130 mi.

Security charges last week forced suspension of three engineers at Republic Aviation Corp., Farmingdale, N. Y. The charges, made by the Eastern Industrial Personnel Security Board of USAF's Security Board, range from alleged Communist connections to psychoneurosis. Each suspension is for 60 days.

USAF Academy site probably will be selected by Secretary of the Air Force Harold E. Talbott within the next 30 days. A site commission, unable to agree on a location, recommended Alton, Ill.; Lake Geneva, Wis., and Colorado Springs, Colo.

Navy's Avenger torpedo bomber will retire from fleet operational service this month, ending a 12-year record that started with the Grumman TBF-1 and ended with General Motors' TBM-3. Navy still has 804 TBMs, plans to use them as advanced and reserve trainers and in utility roles.

How New Sikorsky Copter Hunts Subs

New Sikorsky XHSS-1 demonstrates its sub-hunting technique by dipping a sonar detection device below the surface of the water during a recent press demonstration. Designer Igor Sikorsky (far left) watches the XHSS-1 perform. The sonar may be seen just above the water's surface, suspended from the copter. After sonar and other anti-sub warfare devices locate the sub, the copter launches lightweight homing weapons. First deliveries of the new Sikorsky are expected to be made to Navy squadrons early next year. The XHSS-1 is powered by a Lycoming-built 1,525-hp. Wright R1820 piston engine, uses a Sikorsky-developed autopilot.

A $50,000 scholarship honoring Maj. Lester D. Gardner, retired founder of the Institute of the Aeronautical Sciences, has been set up by the Massachusetts Institute of Technology at Cambridge, Mass.

T-34 Mentors have been ordered from Beech Aircraft Corp., Wichita, by El Salvador. The Central American country is scheduled to take delivery on the gunnery and tactical trainers in August.

Financial

Fairchild Engine & Airplane Corp., Hagerstown, Md., plans to release 577,551 additional shares of common stock on or about June 29, will offer the new issue to present holders on a one-for-four basis prior to the public sale.

Bell Aircraft Corp., Buffalo, N. Y., has declared a mid-year dividend of $1 on common stock, an increase of 25 cents over the similar payment of 1953. The dividend is payable Aug. 1 to common stockholders of record June 30.

Continental Air Lines will pay a dividend of 12½ cents June 30 to stockholders of record June 16.

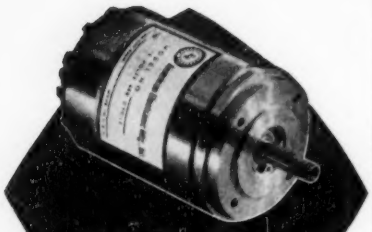
International

Second prototype Sncase S.E.5000 Baroudeur, France's lightweight tactical jet fighter, has made its first test flight. The S.E. 5000 is powered by Sneema's Atar 101.

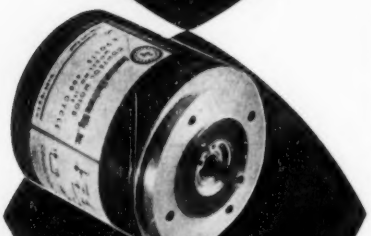
Gen. Umberto Savoia, 82, aviation pioneer who learned to fly with Wilbur Wright and helped found the Italian air force, died June 4 in Viareggio, Italy. At the time of his death, Savoia was general director of the Italian Aviation Co.

First commercial flight of Pakistan International Airways took off last week from Karachi to Dacca, carrying a capacity Super Constellation aircoach load of 90 passengers. Officials say the government-owned line takes a $15 loss on each fare, estimate the operation will require $1,118,000 subsidy annually.

French army air force has increased its order for Sncan's Nord 2501 Noratlas from 40 to 120. Sncan also reports "some" commercial orders for the twin-engine, high-wing airfreighter.



precision resolvers
SIZES 11, 15, 23



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The Aviation Week

June 14, 1954

Headline News

Avro Canada's Mach 2 Fighter..... 11
Scientist Takes 22G's on AF Sled..... 11
Mach 2 Power..... 12
AF, Navy Obligations Lag..... 13
New A4D Designed to Top MiG-15..... 14
Layoffs Hit Piasecki; AF Grounds H-21. 15
U.K. Cracks U.S. Market With Viscounts 16
Nonskeds' Role 18
Aero Commander Gets Swept Tail.. 21
Argentina to Spend $82 Million on Planes 21
London Airport Builds Terminal..... 22
Convair Official Urges Supply Speedup. 24

•

Production Engineering

Analysis Reveals Wright J65 Details.... 28
Windtunnel Experts Form Organization 42
Boeing Opens Giant Flight Test Facility 49
Bomarc Missile Flight Analyzer..... 57

•

Financial

Trunks' Senior Debt Credit Is High.... 63

•

Avionics

Slice Method Cracks Coil Bottleneck... 68
Dutch Radar Merry-Go-Round..... 70

•

Equipment

Taloa Tests Anti-Collision Lights.. 80
UAL Expands Base for DC-7 Fleet..... 80

•

Air Transport

SAS to Fly Polar Route to Tokyo..... 91
CAB Awaits AA Crew Time Reply..... 92
CAB Cuts Braniff Subsidy $2 Million.. 92
CAB Asks Subsidy Offset Law..... 92
Douglas Forecasts 100-Passenger Jet.... 93
TWA Makes Strong Bid for Denver.... 94
AA Stresses Need for Shorthaul Liner.. 94
Skeds Praise ACC Policy Study..... 95

•

Editorials

British Deliver the Goods!.....106
Heinemann's Bantam Bomber.....106
Voluntary Censorship 106

•

Departments

News Digest 7
Who's Where 9
Industry Observer 9
Navy Contracts 45
USAF Contracts 46
Production Briefing 46
Filter Center 74
What's New 79
New Aviation Products..... 84
CAB Orders 96
News Sidelights 104
Aviation Calendar 104

Picture Credits

7—Wide World; 12—NACA; 14—(top) Wide World; 21—Hans Groenhoff; 27—(center) Erwin J. Bulban; 28-29—Curtiss-Wright; 37—(bottom) Erwin J. Bulban; 30, 34, 37-38—Curtiss-Wright; 49, 57, 93—Boeing.

as others see us...

A user tells how AETCO SERVICE helped him

R. W. JUSTICE,
Manager
DEVELOPMENT
DEPARTMENT
Hydraulic
Division
E. F. Houghton & Co.

"One of our customers presented a packing problem to us of sealing air at 100 p.s.i. through a temperature range of from 160°F down to minus 30°F. The cylinder was 4¼" in diameter. Friction was very critical, as the piston had to return by a light spring pressure.

"Total allowable leakage was 10 p.s.i. in 5 minutes. Total allowable friction was 8 pounds throughout the temperature range.

"After designing and developing a packing which passed these specifications, we believed it advisable to have an outside laboratory check our results.

"We described our problem to Aircraft Equipment Testing Company, Baltimore, by 'phone, and asked how soon the work could be completed, as we were pushed for time. The result was that the following day three of our Engineers drove to AETCO with the test unit and reviewed the specifications and methods of test.

"Within one week, we had a verbal report and, within ten days, a complete detailed report, including photographs.

"AETCO was well qualified to do the work due to their complete knowledge of hydraulic and pneumatic applications and their facilities including equipment and personnel. We felt they did a very good job for us."

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WHO'S WHERE

In the Front Office

Bennett Archambault has been elected president and a director of Stewart-Warner Corp., Chicago.

Edward T. Bolton, former vice president of Philippine Air Lines, is new executive vice president and general manager of Hiller Helicopters, Palo Alto, Calif. He also will serve on the board of directors.

William C. Winterhalter has been appointed executive vice president and general manager of H. I. Thompson Fibre Glass Co., Los Angeles. **Brandt Goldworthy** has become vice president in charge of the firm's new division, Industrial Plastics Co.

Harvey H. Dwight, president of Aircraft Engine & Parts Co., New York, and an executive of several other corporations, has been elected a director of Lear, Inc., Santa Monica, Calif.

Changes

C. E. Pappas is new chief of aerodynamics and thermodynamics for Republic Aviation Corp., Farmingdale, N. Y. Also promoted: **Jerry Pavelka,** chief of aerodynamics; **Robert F. Wichser,** chief research engineer; **Paul S. Baker,** thermodynamics and dynamics flight test chief; **James S. Martin,** chief of structure, research and weights, and **Walter R. Bush,** technical assistant to the chief engineer.

William D. Reed, former Convair superintendent of fabrication, has been appointed works manager of H. & B. American Machine Co.'s Midwest Division, Indianapolis.

R. C. Stewart has become chief engineer for Longren Aircraft Co., Torrance, Calif.

Joseph F. Chalupa has been promoted to assistant works manager of Westinghouse Electric Corp.'s Aviation Gas Turbine Division, Philadelphia. **R. M. Wilson** has been named sales manager for Westinghouse defense products.

Leo A. Schmidt has been moved up by Illinois Institute of Technology's Armour Research Foundation, Chicago, to supervisor of the aerodynamics and compressible flow section of the propulsion and structural research department.

Denton E. Zesiger is new director of field representatives and subcontract sales for Goodyear Aircraft Corp., Akron, Ohio. Other changes: **Harold P. Partenheimer, Jr.,** in charge of sales of radar structures, GEDA computers and associated products; **George M. Quinn,** contract administration manager.

Ellis E. Reed has been appointed public relations director for Icelandic Airlines.

Honors and Elections

Norman L. Mochel, manager of metallurgical engineering for Westinghouse Electric Corp., has been nominated for election as president of the American Society for Testing Materials at the organization's 57th annual meeting this week in Chicago.

J. T. Dyment, engineering director for Trans-Canada Air Lines, has won a fellowship in the Royal Aeronautical Society for contributions to the technical development of air transportation.

INDUSTRY OBSERVER

► First production model of the Douglas F4D Skyray Navy fighter has flown past Mach 1 in level flight during a hop from El Segundo, Calif., to Edwards AFB where it will undergo flight testing. The production F4D is powered by a Pratt & Whitney Aircraft J57 with afterburner. Bob Rahn was the pilot.

► **USAF has placed a new $79-million contract with North American Aviation for an undisclosed quantity of F-100C Super Sabre supersonic fighters.**

► Lockheed has a USAF contract to build 20 C-130A turboprop transports at its Marietta, Ga., plant at a cost of $57 million.

► **Next USAF equipment scheduled to emerge from official security wraps are the Lockheed XF-104 lightweight day superiority fighter now at Edwards AFB for flight testing and the Northrop XB-62 Snark, long-range guided missile. The Snark has been visible to patrons of a public airport in California for some time.**

► Hamilton Standard Division of United Aircraft Corp. has a subcontract from Convair to provide the air conditioning and pressurization system for the XB-58 supersonic bomber (AVIATION WEEK May 24, p. 13).

► **Airborne radar's ability to identify positively areas of extreme turbulence in a thunderstorm may cut en route flight time materially. Panagra pilots report in preliminary evaluation of a military X-band set now in use on a DC-6B. Pilots report that radar materially reduces unnecessary throttling back and eliminates wide route deviations in bad weather and also reduces pilot fatigue.**

► At recent IATA meeting in Barcelona, technical experts agreed vertical separation of aircraft should be based on constant pressure intervals, with a fixed pressure assigned to each flight. This is favored because in many parts of the world reports are lacking that permit pilot to adjust altimeter before and during flight. Abolishing flight levels based on corrected barometric pressure may require new instrumentation in all aircraft so pilots can read constant pressure as well as altitude.

► **Certification team from Civil Aeronautics Administration which has been in England to check the Vickers Viscount (see p. 16) also reportedly conducted preliminary investigation of the Bristol 173 helicopter and the Fokker F-27 turboprop transport.**

► Thieblot Aircraft Co., Bethesda, Md., now is operating the airport at Martinsburg, W. Va., a former airline stop. Thieblot will use facility for flight-test work.

► **Air Materiel Command has 120 Fairchild C-82 transports for sale as surplus. Prospect is that amount of general Air Force surplus will grow under "Operation Spring Clean," now under way as economy measure.**

► Major problem for manufacturers of synthetic rubber sealant used in integral fuel tanks: test methods capable of duplicating conditions in actual use without use of elaborate equipment.

► **Prototype model of a new type airborne transponder beacon, which will identify individual civil aircraft on ground surveillance radar scopes, is slated for delivery next month for evaluation by CAA's Technical Development Evaluation Center at Indianapolis. Radar beacon was developed by Stewart-Warner under Air Navigation Development Board sponsorship.**

► Aircraft industry soon will be given an opportunity to comment on a proposed USAF handbook for guided missile designers. Wright Air Development Center and Aircraft Industries Assn. are doing the necessary liaison work.

► **Douglas A4D Skyhawk (see p. 14) is scheduled to fly this week at the Air Force Flight Test Center, Edwards AFB, Calif., with Bob Rahn as Douglas' pilot for Phase 1 testing.**

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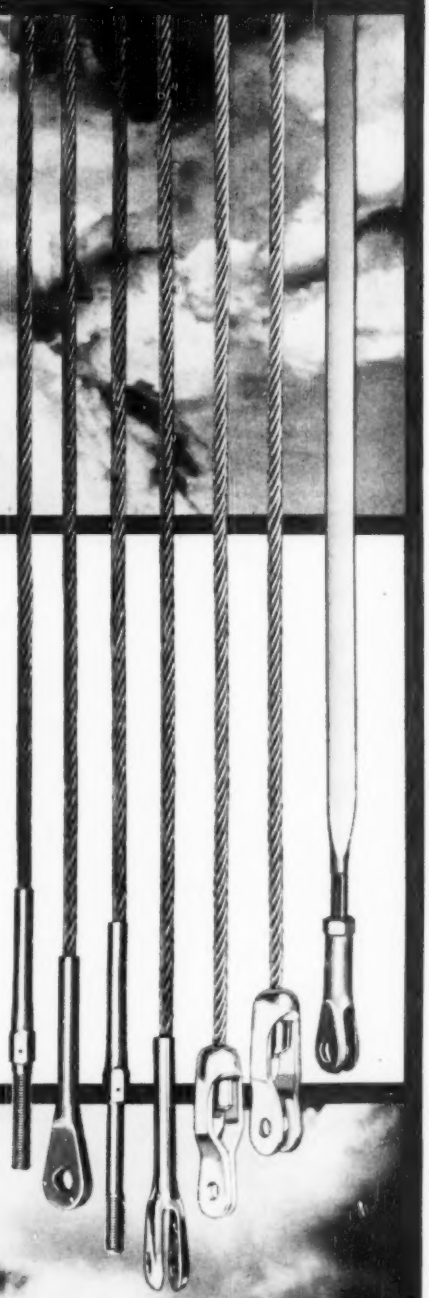

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AVIATION WEEK VOL. 60, NO. 24
JUNE 14, 1954

Avro Canada Developing Mach 2 Fighter

- **RCAF's delta-wing CF-105 will be powered by twin turbojets, each with 20,000-lb.-thrust potential.**
- **First prototype is expected to fly in 1956, with quick conversion to assembly-line production planned.**

By Irving Stone

Canada is pushing development of a mighty new airplane-engine combination—a big delta-wing Mach 2 two-place interceptor muscled by a pair of jet powerplants each with a thrust potential of 18,000-20,000 lb. without afterburner.

Both units are being developed by A. V. Roe Canada, Ltd., Malton, Ont., airframe and engine designer and builder.

• **The airplane** is the Avro CF-105 (AVIATION WEEK Mar. 15, p. 264). Under an initial contract, Avro will build two prototypes—the first targeted to fly in 1956.

• **The engine** is a long twin-spool turbojet, which probably will begin test stand runs in January 1955. Later it probably will be test flown in A. V. Roe & Co.'s Vulcan, the English parent company's four-jet, delta-wing bomber.

► **Advanced Replacement**—The CF-105 is projected as the production replacement for Avro's CF-100, now being turned out in quantities as the all-weather Mark 4 version of the series. Just as the CF-100's long-range, heavy firepower and quick time-to-height complements the shorter-range Canadair-built F-86 dayfighter, so will the CF-105 complement whatever successor to the Sabre comes into Canadian production at about the same time.

This successor is likely to be North American Aviation's all-weather F-100, which may be built under license for the Royal Canadian Air Force by Canadair (AVIATION WEEK May 17, p. 15) with improvements over the current F-86 in range, firepower and climb-to-altitude.

While work on the prototype CF-105 is being advanced, considerable study is being conducted with free-flight models of this delta interceptor. Some of this investigation is being done at Canada's National Aeronautical Establishment, some is being conducted in the U. S.

► **Early Production-Tooling**—Considering the production headaches involved in building an interceptor as large as the CF-105 (it will tip the beam with a gross of about 52,000 lb.), it is probable that Avro will try to sell the idea of doing production (permanent) tooling along with the construction of the two prototypes. This would allow Avro to step into a relatively large expansion program quickly.

Also, because considerably more tunnel proving and structural testing is done today than was the custom a few years ago, the "unknowns" of an aircraft are pretty much resolved before the prototype flies. For this reason, it is likely that an order for production quantities of the CF-105 will be forthcoming before the first prototype flies.

► **J67 for First Flights**—The production order for the delta interceptor probably will be smaller than that for the CF-100, now scheduled to be between 600 and 700 units. This is because the CF-105 will replace only the CF-100s in service with the regular RCAF, none being contemplated for Auxiliary Squadrons (equivalent to our National Guard).

The two prototype CF-105s will not be test flown initially with the 18,000- to 20,000-lb.-thrust engine being developed for this delta interceptor. Instead, these first planes will be powered by Wright Aeronautical's J67 turbojets.

De Havilland's Gyron, Pratt & Whitney Aircraft's J57 and a Rolls-Royce jet engine also were considered for flight trials of the prototype deltas.

► **Low Engine Weight**—Avro's new engine, a very long powerplant, will have about the same diameter as the Wright J67. It will incorporate considerable quantities of titanium alloys—in the compressor casings, rotor disks, stator and rotor blades—and is expected to end up at a weight figure of about 4,000 lb., which would afford an unusually high thrust-to-weight ratio.

A derated version (14,000 lb. thrust) of the new powerplant has been proposed for the North American F-100 on the contingency that the plane will be built in Canada as the Super Sabre by Canadair.

► **Quick Action**—Plans for the new high-thrust engine first were shown to top officials of the Hawker Siddeley Group, of which Avro is a member, in October 1953, when these officials visited Canada. Detail work on the engine was started soon after.

Target date for the test stand run is set for November this year, but January 1955 is more realistic.

By the time the engine does run, it is estimated that Avro will have put about $4 million into the project.

Scientist Takes 22Gs On AF Rocket Sled

Riding a rocket-propelled sled at USAF's Holloman Air Development Center in New Mexico, Lt. Col. John P. Stapp recently was shot over the tracks at 421 mph., faster than any human has traveled on the ground.

Stapp withstood a force of 22Gs, equivalent to a distributed load of 3,960 lb. on his body when the sled was stopped by water brakes at the end of its 3,500-ft. run. Purpose of the test, according to the Air Research and Development Command, was to study the effect on a pilot of bailing out at very high altitude and supersonic speed.

► **800-Mph. Speed**—Fastest previous ride on a sled was 180 mph. set by Lt. Col. Stapp at Edwards AFB, Calif. He is now chief of the Aero Medical Field Laboratory at Holloman.

Sled used at Holloman, designed by Northrop Aircraft, Inc., eventually will carry volunteer pilots over the track at speeds up to 800 mph., ARDC says. The new medico base is 4,092 ft. above sea level, where a speed of 800 mph. is equal to 1,800 mph. at 40,000 ft.

► **Rocket Ride**—For Col. Stapp's record run, only six of 12 rockets built into the unit were discharged. The rockets are mounted on a propulsion sled that weighs 3,500 lb., each rocket providing 4,500 lb. of thrust. The unit on which Stapp was fastened for his highspeed ride is a separate vehicle that weighs 2,000 lb. with its passenger.

Both sections are mounted on steel tracks, imbedded seven feet apart in a concrete bed. A water trough between the tracks provides braking for the sled when metal scoops are lowered.

In addition to Northrop and Holloman technicians, scientists from Wright Air Development Center are assisting.

Mach 2 Power

- **Plane engine revolution under way at Lewis Lab.**
- **NACA aim is sustained flight at 1,300 mph.**

By Robert Hotz

Cleveland—Revolutionary changes in powerplant design and construction are under way aimed at pushing practical aircraft operating speeds up to Mach 2 —1,300 mph. at standard temperature above 30,000 ft.

The powerplant revolution now gathering momentum rapidly is comparable in scope and military importance to the radical changes in airframe design that have boosted the potential of airframe performance from subsonic speeds to more than Mach 2 during the past decade.

▶**NACA Inspection**—Broad outlines of the powerplant revolution were sketched by scientists of the National Advisory Committee for Aeronautics for 1,400 military and industry representatives during the three-day 1954 inspection of the Lewis Flight Propulsion Laboratory here.

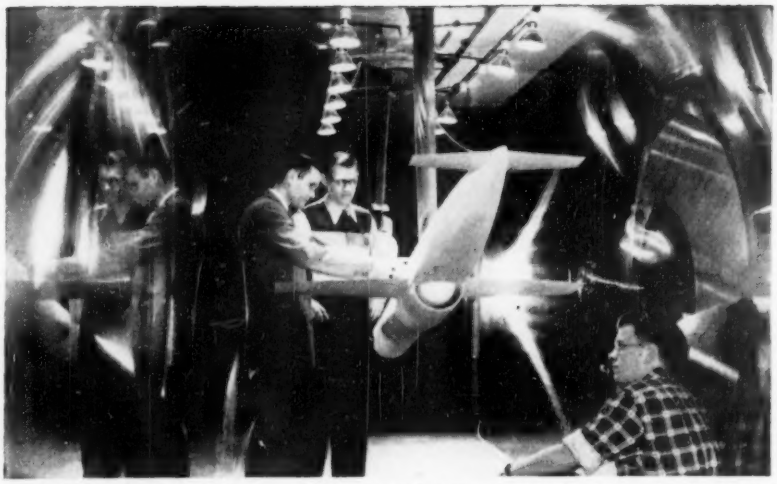
"There is no sign that we are nearing the end of spectacular accomplishment in aeronautics," Eugene J. Manganiello, assistant director of the Lewis Laboratory, told participants in the inspection.

"Never in the history of aeronautics have there been so many fruitful ideas to be explored by research, and never has there been a greater need for exploitation of these ideas. Urgency is a consideration which increasingly must affect the thinking and actions of our aeronautical team."

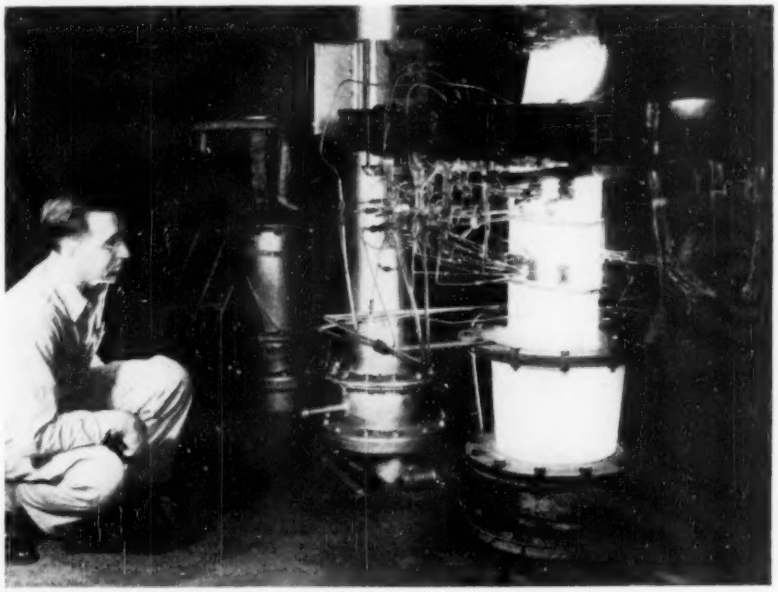
▶**Critical Need**—"Because of the very large amounts of thrust required to reach higher supersonic speeds and provide greater range, the need for greatly improved powerplants has become critical," he said. "Somehow the military services, the manufacturers, and the NACA, working as partners, must find ways to accelerate the process of transforming ideas into the useful developments upon which our country's aeronautical progress depends."

The sense of urgency for the development of powerplants capable of driving airframes for sustained flight at speeds around Mach 2 was a dominant note both in the formal NACA discussions and in informal comment by military and aircraft industry representatives.

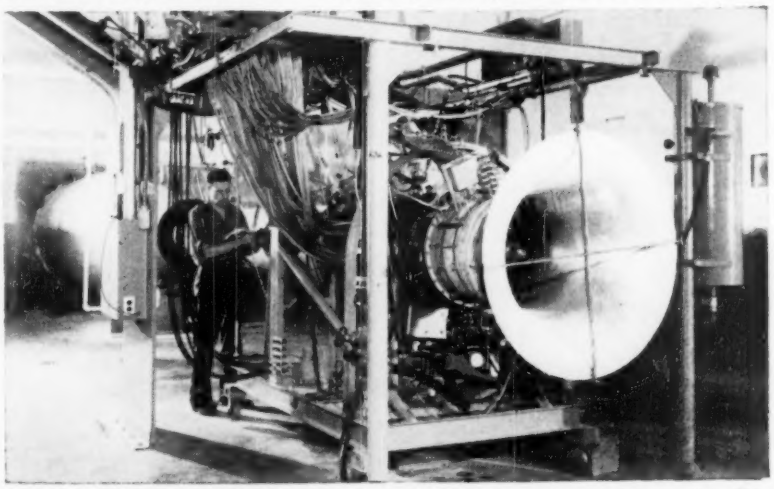
Although NACA says its greatest engine research effort is being concentrated on jets, it is evident from the



RAMJET MISSILE MODEL is readied for Mach 2 tests at 50,000-ft. simulated altitude.



COMBUSTION CHAMBER tests near 1,600 deg. cover ignition, coke deposits, efficiency.



HIGH-EFFICIENCY COMPRESSOR is instrumented for internal pressure, temperature data.

scope of the Lewis Laboratory's nuclear program that development of a practical atomic powerplant for aircraft is progressing faster than is realized publicly.

▶ **Concerted Effort**—"The performance capabilities to be realized from harnessing nuclear energy for aircraft propulsion would be nonstop supersonic flight to any point on the face of the earth and return," Manganiello told his audiences. "With so large a gain the goal, industry, the Atomic Energy Commission, the military services and NACA are participating in vigorous, sustained attacks on the formidable technical problems that must be solved" (Aviation Week May 24, p. 28).

"We are moving toward a clearly defined goal we know we can eventually reach," another NACA scientist told Aviation Week in discussing the nuclear research program. "We now know the technical problems that must be solved and we know that they can be solved.

"Now the rate of progress will depend largely on how much time, energy and money is applied to the program."

Much of the NACA nuclear powerplant research is devoted to the search for suitable material to provide lightweight shielding from various types of radioactivity and to provide suitable heat-transfer devices for an aircraft atomic reactor.

NACA scientists defined the problem of producing a turbojet capable of powering aircraft at sustained high supersonic speeds as getting a powerplant that will produce tremendous power in a small, lightweight package, with a combination of high operating efficiency and low fuel consumption to deliver sufficient flight range to perform military missions.

▶ **Weight Factors**—The problem of engine development is becoming more acute as the realm of tactical aircraft moves from Mach 1 to Mach 2, because the combination of engine weight and fuel is taking a higher percentage of total aircraft weight as speeds continue to increase.

For Mach 2 aircraft, engine and fuel weight will account for as much as 60% to 65% of the total gross weight at takeoff.

Among the trends in turbojet development leading to Mach 2 performance the NACA researchers cited the following:

• **Compressors.** Basic design changes aimed at handling a larger mass airflow with a relatively small frontal area of the engine.

Among the successful experiments in compressor design resulting in increased mass airflow are: increased blade length and reduced rotor hub diameter; increased blade speeds, and removing inlet guide vanes to increase airflow velocity.

• **Combustion chambers.** New designs in combustion chambers are required to sustain burning at the increased air velocity provided by more efficient compressors. New hole patterns in the flame-tube liner and a somewhat thinner combustion chamber design are promising trends toward flame tubes that can function efficiently at about twice the air velocity of current engines.

• **Turbine.** Higher gas temperatures through the turbine mean higher thrust. NACA has explored methods of allowing increased gas temperatures over the turbine by using new heat resistant alloys and ceramic blade coatings and also by air cooling the turbine blades internally.

• **Shock-wave control.** NACA has experimented successfully with shock-wave control as a method of increasing turbojet efficiency at speeds up to Mach 2 by using an adjustable diffuser to position and stabilize the shockwave on the engine air inlet. By-pass doors on the compressor also are used to dump excess air in the engine that would result in unstable shockwaves. From these experiments NACA also has developed a successful automatic control for ramjets.

• **New fuels.** Increased range for turbojets operating at supersonic speeds must come in part from fuels with better heat content than the present JP-4 military jet fuel. NACA researchers believe. They see possibilities of eventually using some metals and metal hydrides that have higher heat contents than the hydrocarbons—such as gasoline and JP-4—as aircraft fuels.

NACA also is exploring new types of rocket engine fuels with higher energy than the currently popular alcohol-liquid oxygen combination and is working on methods of building new synthetic fuels by altering molecular structure.

• **Jet engine fires.** NACA crash fire research has been expanded to include turbojet engines and has yielded a simple but effective inerting system that shows great promise in preventing the ignition of aircraft fires when large quantities of fuel are vaporized in landing or takeoff accidents.

NACA research has produced a pressurized water spray system that cools the potential ignition spots of a turbojet at the moment of crash impact and before they are in contact with the vaporized fuel clouds that follow impact of the aircraft.

• **Reverse thrust.** NACA has developed a new variation of reverse thrust mechanism.

The new device convincingly was demonstrated when it moved a parked F-84 directly backwards, indicating it was developing about 50% reverse thrust.

AF, Navy Aircraft Obligations Still Lag

Obligation of funds for aircraft and related procurement continued to lag through April, despite earlier Air Force and Navy plans sharply to accelerate contract letting (Aviation Week Feb. 15, p. 13).

USAF's deobligation of funds during April exceeded obligations by $24 million. Navy's net obligations were only $4 million.

As of May 1, the two services had a $7.3-billion total in unobligated plane procurement funds on hand: USAF $5.9 billion, and Navy $1.4 billion.

▶ **Carryover Increase**—This means the two services will finish fiscal 1954 June 30 with a vastly greater carryover of unobligated procurement funds than the $2.3 billion contemplated last January when the new fiscal 1955 budget was submitted to Congress.

At that time, Assistant Secretary of Defense W. J. McNeil estimated USAF's carryover into fiscal 1955 would be $1.8 billion, and the Navy was expected to have a "normal" carryover of approximately $500 million.

Slow obligation rate of procurement funds, indicating a lag in moving forward with new production, is understood to be the major factor stimulating a month's investigation tour of aircraft and engine plants by a top-level Air Force team, headed by Roger Lewis, Assistant Secretary for Materiel.

Members of the team: Gen. E. W. Rawlings, commander, Air Materiel Command; Lt. Gen. Bryant Boatner, Deputy Chief of Staff for Materiel; Maj. Gen. C. S. Irvine, AMC Deputy Commander; Lt. Gen. Donald Putt, Deputy Chief of Staff for Development; Lt. Gen. Thomas Power, Commander, Air Research and Development Command; Trevor Gardner, Special Assistant to the Secretary of the Air Force for Research and Development.

▶ A comparison with last year's procurement record highlights the apparent lag:

• During 10 months of fiscal 1954, USAF net obligations totaled $370 million, for aircraft and related procurement. This compares with $8.8 billion for the same fiscal 1953 period.

• Navy obligated a $417 million net for plane procurement during the 10 months of fiscal 1954, compared with $2.9 billion for the same fiscal 1953 period.

Meanwhile, USAF and Navy expenditures for aircraft and related procurement continued at a high rate and probably will reach a $9-billion total for fiscal 1954, instead of the $8 billion estimated.

During the first 10 months of the year, expenditures totaled $7.5 billion.

STUBBY A4D SKYHAWK, single-seat lightweight Navy attack plane, stands high off the ground on tricycle landing gear.

New A4D Designed to Outperform MiG-15

LARGE INTAKES behind Skyhawk's cockpit feed single Wright J65-W-2 Sapphire turbojet.

El Segundo—The Navy last week unveiled the smallest and lightest U.S. jet combat plane yet revealed—the Douglas A4D Skyhawk.

The single-place triangular-wing midget atomic bomber is so small it will fit within the folded wingspan of a traditional Navy carrier-based plane.

Yet, it has been designed to fly nonstop across the continent and will have a speed greater than Russian MiG-15 fighters.

The Skyhawk in its simplicity of design, light weight and low cost is the end product of the philosophy of its chief designer, Ed Heinemann, and Douglas Aircraft Co.

Although security regulations would not permit disclosure of detailed specifications or performance, Heinemann told newsmen the bantam bomber is a little less than half the weight of many current operational jet fighters which weigh in at about 30,000 lb., has a wingspan between 26 and 28 ft., and is approximately 35 ft. long. Powerplant is a single Wright J65-W-2 turbo-

ATTACK PLANE CONTRAST: Tiny Douglas A4D Skyhawk and big twin-jet Douglas A3D Skywarrior show different shapes and sizes.

jet rated at more than 7,200 lb thrust.

"Under our program of design simplification," he said, "the A4D gained 20% more in speed and a third more in range than was at first thought possible."

▶ **Subsonic Speed**—Its speed is designed to be subsonic in level flight, the El Segundo Division chief engineer said, but it will be tested at supersonic speeds in dive.

An announcement cleared by Navy disclosed:

- It will fly faster over greater distances with a more powerful striking load than any airplane of its type. Construction is of aluminum alloy.
- It has a combat radius greater than present propeller-driven attack airplanes.
- It has been designed to operate from all sizes of Navy carriers and from short landing fields.
- More Skyhawks can be stored in an aircraft carrier than folded-wing planes.
- It is capable of carrying atom bombs or rockets, machineguns, missiles and other weapons to suit the wide variety of missions of attack-type airplanes.

The tiny bomber, nicknamed the Heinemann "Hot Rod," rolled out of the Douglas plant only 19 months after it was conceived, Heinemann said. It is due to make its maiden flight later this week.

The chief engineer said he had long felt there was a need for a smaller, low-cost airplane to carry the modern A-bomb and enough electronic gear to operate under all-weather conditions.

"The A4D is believed to be a major step in designing an airplane on a completely functional basis, making each requirement stand on its own feet rather than by doing things because they have been done that way in the past," he said.

▶ **Equipment Simplified**—To realize such an airplane, Heinemann said, weight savings had to be achieved through emphasis upon simplification. Given a free hand by the Navy, he has fought against excess weight on every subcontracted article in the plane.

- **Packaging communications equipment** including IFF equipment into one compact aluminum case saves approximately 105 lb. on this item alone.
- **Bombsight,** which weighs 18 lb. in other aircraft, has been cut to only 6 lb.
- **New ejection seat** weighs approximately 30 lb. as compared with about 70 lb., weight of the lightest one now being used. It is made up of only 80 parts, whereas current models contain 240, Heinemann said.
- **Air conditioning system** is said to be one-third the weight of the type formerly used.

Heinemann paid tribute to Navy's BuAer for assistance in re-designing equipment components to make the Skyhawk's simplification program possible. "Revolutionary techniques" in engineering, tooling and production have permitted A4D line production to start immediately. An undisclosed number for service test is now on order, the company discloses, and can be produced in the time normally required to build one experimental airplane.

▶ **Tailored Cockpit**—Test pilot Bob Rahn said when he saw the first mock-up of the small plane he immediately hopped into the cockpit "to see if I would fit." Actually, there was plenty of room. They've tailored the cockpit without sacrificing comfort and convenience of the pilot, he said.

Navy said the lightweight design philosophy incorporated in the A4D should open a new era of high-performance jet attack airplanes not thought possible a few years ago.

Layoffs Hit Piasecki As AF Grounds H-21

An Air Force order grounding the H-21 Work Horse for a second time is forcing layoff of several hundred Piasecki Helicopter Corp. employes at the Morton, Pa., plant. Action was taken when test aircraft at Edwards AFB, Calif., lost a blade after 27 modifications had been incorporated (AVIATION WEEK June 7, p. 11).

Spokesmen for Piasecki last week said the new grounding order has forced a revision of the H-21 production schedule, slowing production until all modifications are frozen and can be incorporated into the helicopters on the production line. Work Horse output had been maintained on schedule, but the groundings have resulted in a large backlog of completed aircraft that cannot be flown from the plant until changes are completed.

▶ **Layoff Indefinite**—Don R. Berlin, president of the company, said he had no idea how long the layoff would last. More than 100 production workers were given their notices June 4, and Berlin said the layoffs would continue "for the next two weeks."

Piasecki early this year had approximately 4,700 employes and most of the assembly line workers have been on the H-21 project as contracts for the Navy HUP and Army H-25 were phased out. Last HUP is scheduled for delivery this month.

▶ **Ardmore Lease**—The initial H-21 grounding order was issued Feb. 10, on the eve of an accident near Trois Pistoles, Quebec, in which two USAF pilots and a Piasecki service representative were killed. The second grounding order was dated May 17, Berlin disclosed.

"This is an operation which I don't like," Berlin told the employes, "but it is apparent that there is no way by which it can be prevented."

In addition to the Morton plant, Piasecki recently leased 245,000 sq. ft. of space in Ardmore, Pa., where the company plans to manufacture some components now made by subcontractors.

A hiring program for the new facility is expected to get under way this summer.

CAPITAL'S TURBOPROP VISCOUNTS will look like this when the new British transports go into service in U. S. next April.

Capital Airlines Buys Turboprops

British Crack U.S. Market With Viscounts

Vickers-Armstrongs, Ltd., of Great Britain has made a major penetration of the U. S. airline equipment market with the sale of three turboprop Viscounts and options for 37 more to Capital Airlines. These are the first turboprop transports purchased by a U. S. airline.

The purchase could prove a significant blow to the U. S. aircraft industry, particularly since it is the second time in two years a foreign manufacturer has cracked the market in this country with quantity orders of modern transports. Pan American World Airways has ordered three de Havilland Comet 3s, with an option for an additional seven (AVIATION WEEK Oct. 27, 1952, p. 13).

Capital's action is taken as a warning to U. S. manufacturers who for many years have enjoyed a monopoly on domestic airline equipment. Many of these companies admit to more than mild concern, fearing the move could mean the start of an industry trend.

▶ **$45-Million Deal**—CAP president J. H. Carmichael says the Viscount deal "approaches $45 million," including 15% import duty. He says satisfactory arrangements for financing have been made, although he declines to reveal exact terms.

"The financing arrangements are mutually satisfactory," he told AVIATION WEEK. "It is a perfectly normal business deal with no premiums involved. The arrangements provide sufficient capital to handle the entire program."

▶ **Early Delivery**—The British were quick to press their new-found advantage by promising early delivery of the first three Viscounts. Vickers reports delivery has been hastened by British European Airways consent to postponement of three of its Viscounts in favor of Capital. BEA notes it is doing this "in the national interest."

The initial turboprop planes are scheduled for delivery early next year. These will be the 700 model. Other 37 Viscounts will be the 700-D series, deliveries of which will begin early in 1956 and be completed late in 1957.

Viscount Record

Viscounts presently operate over 40 European routes.

First prototype flight took place on July 16, 1948, and the aircraft was placed in London-Paris and London-Edinburgh passenger service in the summer of 1950.

The first production Viscount was flown in August 1952, and was placed in scheduled service by British European Airways in April 1953. At the completion of the Viscount's first full year of service with BEA, the airline's share of traffic on highly competitive routes increased from 28% to 49.2%.

Carmichael emphasizes that there is little doubt Capital will exercise its option for the additional 37. In his opinion, the Viscount is the answer for airlines flying intermediate-haul routes such as those of Capital. He says there is no comparable transport available in this country that will do the job.

Reports indicate, however, that any other U. S. airlines that might decide to get into the Viscount picture would have difficulty getting deliveries before one to one-and-one-half years. Current orders for the aircraft now total more than 100.

As for Civil Aeronautics Administration certification, Carmichael anticipates no trouble: "We did not see the CAA certification team in England, but while I was there I did not hear of any problems involved in the certification of the aircraft." The team is expected to make a recommendation to CAA Administrator Fred B. Lee this month.

▶ **Outstanding Record**—Carmichael says Capital has been searching several years for a suitable aircraft for its routes and called the Viscount's operating record "outstanding."

"There will be no section of our system where we cannot compete with other domestic airlines, and in a few sections we will be able to better their schedules. The Viscount still has further development ahead of it and gradually will improve its performance with experience."

He points out that on more than 80% of Capital's route structure "we compete with the 'Big Four,' and you can't do this successfully without a first-class airplane. We had an acute need for a four-engine plane comparable to Big Four equipment."

▶**335-Mph. Cruise**—Powered by four Rolls-Royce Dart turboprops, the Viscount cruises at about 335 mph., and CAP expects to cut flight time over certain segments of its system by a considerable margin.

The company president says the run from New York to Cleveland, for example, which now takes 1 hr. 55 min., will be made in 1 hr. 31 min. Between Detroit and Washington, the Viscount will be able to establish a schedule of 1 hr., 28 min., compared with current 2-hr. operations.

Carmichael believes a big factor in promoting the Viscount will be its vibrationless performance. And the fact the turbine engines provide a lower noise level than piston-powered planes also should have strong passenger appeal, he says.

▶**'Finest' Pressurization**—He is particularly enthusiastic over the British pressurization system in the Viscount, calling it the finest he has found in any aircraft. He cites one test run between London and Copenhagen, a distance equivalent to Capital's New York-Chicago run:

"We flew to Copenhagen at an altitude of about 26,000 ft., returned to London at about 25,000 ft., then made our descent at the rate of about 3,000 fpm. with no noticeable effects whatsoever."

While the pressurization system is British, all instrumentation, navigational and radio aids for Capital's planes will be U. S. manufactured. All installations will be made at Vickers, however, with the planes delivered complete in this country.

▶**First-Class Service**—Carmichael says service will be started no later than next April.

The first Viscounts will be used for first-class service exclusively under present plans, with seating capacity of 48. Seating can be increased to 56, if and when the planes are utilized for air-coach.

The Capital chief executive says he feels it is "highly significant" that with a 48-seat installation the plane can operate with a 50.6% load factor as the break-even point. With the 48-passenger configuration, seating would be four abreast. Six-abreast arrangement would be used with 56 seats, only if coach service is initiated.

As the Viscounts are delivered, they will replace CAP's Constellations first, then its DC-4s, finally its DC-3s.

"The airplane," Carmichael says, "comes closer than any other in permitting us to standardize by using one engine and one plane. This will give us a cost reduction and greater efficiency in our operations.

▶**Sales Potential**—"I am enthusiastic about the traffic-producing potential of the Viscount. It will be completely competitive with the DC-7 and the Super Connie, and set a standard of service that will not be exceeded in our area."

The plane, he says, "sells itself. It is glamorous and captures the imagination. The piston plane has reached its high point and the development of the art suggests that the turboprop is next. Capital is proud to be the first to introduce the turboprop on airlines in the U. S."

He adds that while Capital is aware of other developments in the air transport field, "we did not look at any other plane while we were in England." Carmichael says his airline has been looking for a plane that "meets our requirements and the Viscount is it. I couldn't be more pleased with the aircraft if it had been designed to our specifications."

▶**Overhaul Center**—Capital has not revealed definite plans for maintenance of the new planes, but engine overhauls for the first three will be handled by Rolls-Royce at Derby, England. "Ultimately we will develop our own overhaul center in Washington," Carmichael says.

Overhaul period for the Dart is 750 hr., but Capital expects to extend this at least 100-150 hr. by the time its Viscounts are in full operation.

"We will send our mechanics and maintenance people to England for instructions and they in turn will serve as instructors for the rest of our maintenance crews."

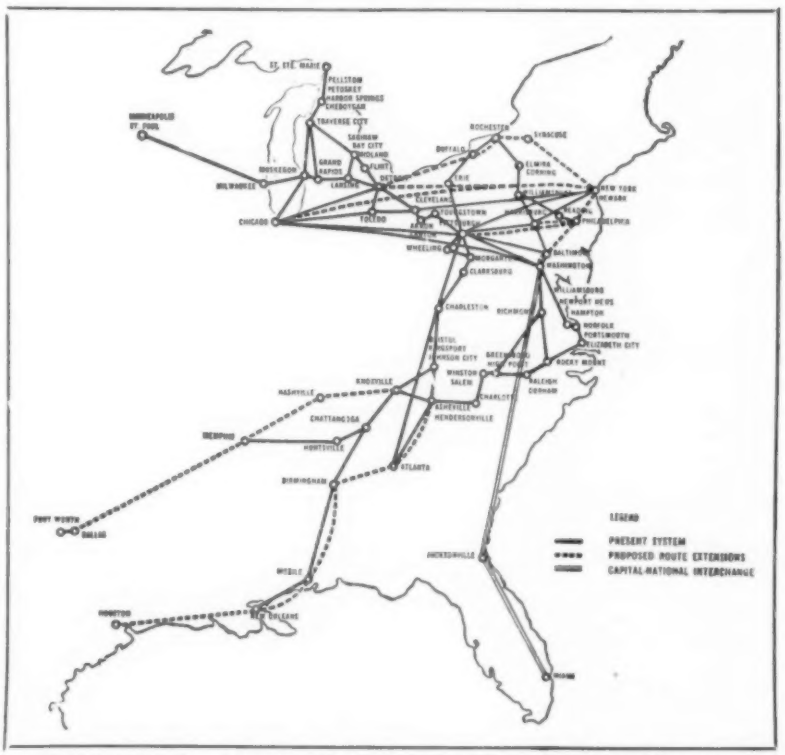
Robert T. Quick, president of District 144, International Association of Machinists at Capital, told AVIATION WEEK he has not had an opportunity to discuss the Viscount purchase with CAP management.

▶**Crew Training**—Vickers will train Capital crews initially, with chief pilots and test pilots going to England. There will be a minimum of eight trained in England, possibly 12, Carmichael says.

Pilots trained in England then will serve as instructors for others. "The transition for pilots is simple and quick," Carmichael explains. "There is nothing complex about flying the Viscount."

Arrangements for obtaining spare parts reportedly have been worked out, but Capital officials decline comment at this time. Vickers reportedly has offered to establish a spare parts depot in this country, where CAP would pay only for parts requisitioned from the depot. In this way, the airline would avoid the expense of maintaining a sizable spares inventory.

▶**Turboprop Impact** – Reactions throughout the industry to Capital's



CAPITAL'S ROUTES, with medium-to-short segments, are particularly suitable to Viscount.

Viscount purchase have been varied.

One major trunkline reports it is taking another look at the Viscount in an effort to determine just what Carmichael is going to do with it. A spokesman says: "I've got Viscount blueprints all over my desk and have had them there for the past several days."

He notes that is a pretty normal reaction when a competitor buys a new airplane.

It also has been noted that if CAP does go through with its plans to buy all 40 Viscounts and sells its varied fleet of Constellations, DC-4s and DC-3s, the airline should be in an excellent position on two counts:

• Maintenance and spare parts planning can be predicated on one type of airframe and engine.

• The problem of spare aircraft will be eased greatly in the event of the breakdown of transports scheduled for flights. The Viscount would be the replacement in all instances, offering the same schedule, speed and performance of the aircraft replaced.

It also is noted that CAP will be in an excellent position to arrange and interchange with Trans-Canada Air Lines at Sault Ste. Marie, a point served by both carriers. This would provide passengers with through Viscount service, since TCA is scheduled to start turboprop operations early next year. First of TCA's 15 Viscounts is due September.

Another reaction to CAP's purchase came from a long-time Washington observer: "I'm glad to see the Viscounts get into this country. Maybe it will wake up U. S. manufacturers to the need for a real civil transport aircraft. Every plane we've received so far originally has been designed for the military; all we get is a modification of the military version."

Nonskeds' Role

- **CAB bureau proposes 5-yr. charter certificate.**
- **Only qualified airlines would win new licenses.**

Temporary certification of qualified irregular airlines to perform bona fide charter services was recommended last week by Civil Aeronautics Board's Bureau of Air Operations.

Bureau counsel Mervin F. Bagan, in a statement of BAO's position in the large nonsked investigation, recommended against granting certificates or exemptions to any of the applicants to provide transportation of individually ticketed persons or individual shipments of property. The statement is the first position taken by the bureau since the investigation started in September 1952.

The recommendation states: "The public convenience and necessity require the authorization of a class of air carriers to provide bona fide charter service for the transportation of persons in interstate and overseas air transportation, and property in interstate, overseas and foreign air transportation."

▶ **Certification**—Following criteria were recommended by the bureau in selection of nonskeds for certifications:

• Extent of the airline's experience in successfully providing recommended services.

• Extent to which the previous operating history of the nonsked has demonstrated recognition of its common carrier obligations to the public.

• Carrier's previous record of compliance with the Board's regulations and those of other government agencies.

". . . Transportation on an individual basis as proposed by the applicants is not 'additional and supplemental' to the scheduled, route-type service provided by the presently certificated air carriers," BAO says.

"This service would parallel that performed by the presently certificated air carriers, since, to be economically feasible, it must be concentrated on high-density route segments where unlimited service on an individual sales basis is already authorized."

▶ **Conditions**—Certificates would be subject to the following conditions and limitations under BOA recommendations:

• Nonskeds should be classified as "certificated charter carriers."

• Each certificate should include authority for the transportation of both persons and property.

• Certificates should be for a temporary period of five years.

• Certificates should not be limited as to frequency and regularity of service.

• Within the recommended authority, certificates should not be limited as to base of operations or areas in which operations may be conducted.

▶ **Charters**—BAO's definition of bona fide charter states: " 'Bona fide charter' contemplates the contracting of the entire capacity of an aircraft for the movement of persons and their baggage, or for the movement of property, or both, on a time, mileage or trip basis.

"Such a charter does not contemplate solicitation by the carrier, his agent or a group-forming or consolidating intermediary of individual persons to make up a charter group, or of individual shipments of cargo to make up a planeload charter of property. Thus, ticket agents, passenger forwarders, airfreight forwarders and other group-forming or consolidating agencies would be prohibited from chartering aircraft.

"In connection with group charters and the question of whether individual soliciting occurs, it is appropriate to determine, among other things, whether the group is a pre-existing group and has a common purpose beyond that of obtaining the transportation itself."

Reverser Takes Three Forms

Snecma, France's nationalized aircraft engine factory, has developed at least three variants of its jet thrust reverser, basically a configuration of annular vane rings for deflecting the tailpipe exhaust forward (AVIATION WEEK, Apr. 12, p. 18). The three versions:

• **Type R** is a retractable installation normally housed between the tailcone and its surrounding cowling. For reverse thrust braking action the cylinder of annular vanes is extended, and a jet of air piped through the middle of the exhaust stream forces the agses through the concentric rings.

• **Type D** is similar except that it is not retractable. It is detachable, however, and is affixed to the tailcone end with a metal strap.

• **Type F** is a fixed installation, projecting from the tailcone end.

With each installation about 20% thrust reversal is available. Loss of engine thrust occasioned with the retractable installation is about 2%, with the detachable and fixed types about 4%.

Additional engine weight imposed by the retractable type is about 5 to 6%, for the detachable and fixed types about 3 to 4% each.

Snecma has tested its reverser on various engines, including the Pimene, the BMW 003, the Goblin, Nene and the Atar.

Research efforts recently have been concentrated on using the thrust reverser in high performance engine applications that employ an afterburner.

Special ACC Study

Air Coordinating Committee's special working group on marking and lighting of tall structures hazardous to air navigation will hold hearings in Washington, D. C., June 24 and 25.

This is the first phase of the group's current study to determine if existing national standards on obstruction lighting and marking are adequate for tall structures.

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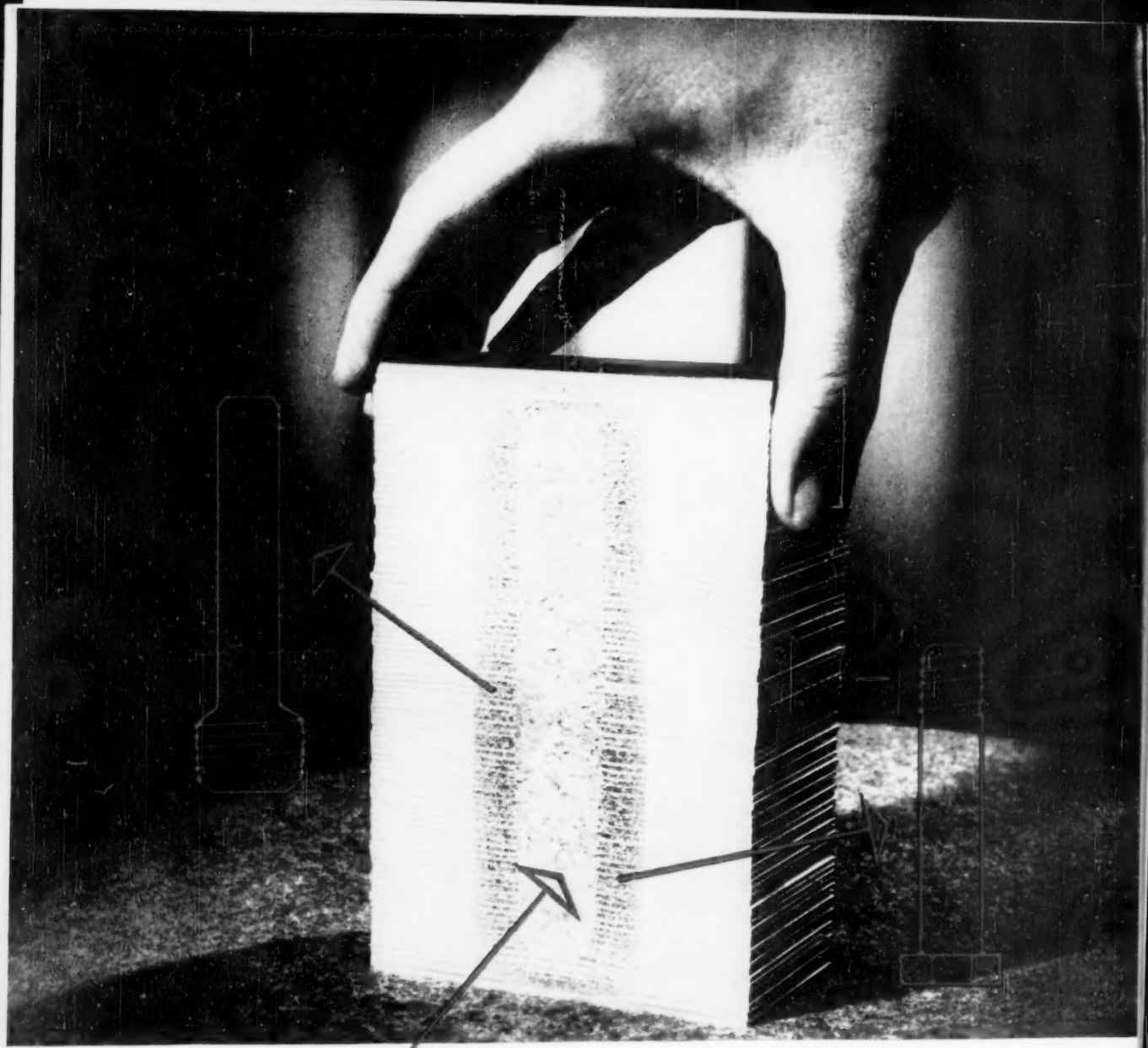

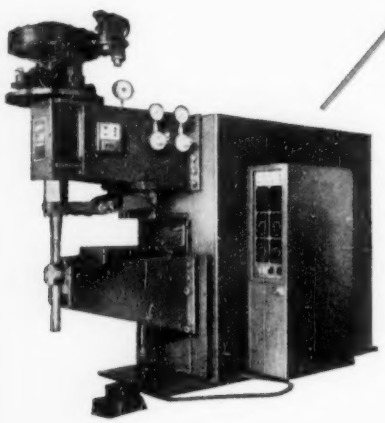

Martin Aircraft Forms Solid Ingots of Scrap Sheet Titanium with Sciaky Spotwelder

The Manufacturing Research and Development Unit of the Glenn L. Martin Company has developed a technique to utilize virtually all their scrap sheet titanium. A six inch pile of 85 laminations of .064 titanium with two laminations at each end of .091 titanium is joined with one weld on a Sciaky type PMCO 6ST 400 KVA Three-Phase Spot Welder.

The weld nugget forms a solid ingot of virgin metal at least as strong as the parent metal. This ingot can be machined into a variety of titanium parts. An expensive waste is almost entirely eliminated, and the months of lead time required for delivery of titanium for machining is avoided.

Martin Research offers another fine example of Sciaky basic thinking in design with resistance welding equipment to do *more useful work* at the *lowest operating cost* with *maximum reliability.*

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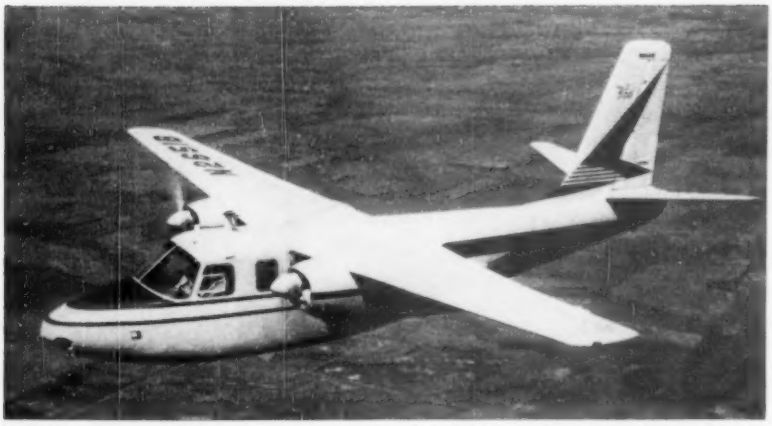

SWEPT TAIL marks new Aero Commander 560 business plane, now in production.

Aero Commander Gets Swept Tail

A new swept-tail Aero Commander business plane, the Model 560, has been put into production by Aero Design & Engineering Corp., Bethany, Okla.

The faster, heavier 560 replaces the Model 520. It is priced at $69,500 in the standard model, flyaway-factory. First deliveries are scheduled to start this month.

Seating is from five to seven, with an individual arrangement for six possible by placing one by each window. Seats can be removed quickly for cargo carrying, making room for more than 2,000 lb. of payload.

▶ **Powerplants**—The Aero Commander 560 is powered by two Lycoming GO560B geared engines, with a takeoff rating of 270 hp. each and continuous rating of 260 hp. Engines have chrome-plated rings for longer service life.

A new engine generator, some eight or nine pounds lighter than the previous type, is installed. Two are used as standard equipment. This 50-amp. blast-cooled generator is designed to turn at 8,000 rpm.

Inside the engine cowling is a newly developed air induction system, providing a balanced airflow to the carburetor. A grid at the carburetor neck straightens airflow and provides even fuel distribution to the cylinder, helping keep cylinder temperatures even.

▶ **Performance**—Top speed at 5,500 lb. is given as 209 mph.; service ceiling at this weight is 22,000 ft. At 6,000 lb., service ceiling with one prop feathered is 8,000 ft.

Two-engine rate of climb at sea level at 6,000 lb. is 1,400 fpm. and 325 fpm. with one engine feathered. Sea level power-off stall speed at maximum load with landing gear and flaps extended is 59 mph.

▶ **Equipment**—Included in the $69,500 price as standard equipment are an emergency exit, internal control locks and a tow bar. These formerly were optional.

Other standard items are full-feathering, all-metal Hartzell propellers, a full set of all-weather flight instruments and a Lear LTRA-6 radio that has a VHF transmitter and receiver and a low-frequency receiver.

Also standard on the new plane is an auxiliary hydraulic system so that, in an emergency, fluid can be manually pumped from a reserve tank to operate flaps and brakes.

The Aero Commander's power steering has been improved by increasing travel of the nosewheel to 28 deg. A heavier steering cylinder piston has been installed in this system.

Argentina Will Spend $82 Million on Planes

(McGraw-Hill World News)

Buenos Aires—Argentina plans to spend at least $82.5 million by the end of 1957 on development and production of aircraft, including a new turbojet-powered plane expected to reach speeds of more than 750 mph.

The Ministry of Aviation will put the supersonic aircraft on the assembly lines of the large government-operated Industrias Aeronauticas y Mecanicas del Estado at Cordoba after the prototype model, now undergoing windtunnel trials, completes its test program.

▶ **Argentine Design**—Production schedules set up by the Ministry under the new spending program also call for IAME manufacture of these Argentine-designed aircraft:

• **Pulque 2**, claimed by the government to be one of the most modern jets of

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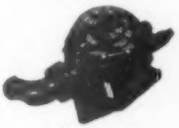

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its class in the world. It will be mass produced shortly, according to an official announcement.

• **Justicialista del Aire IA-35,** one of this country's best propeller-driven aircraft. Powered by the locally built 800-hp. El Indio engine, this plane is destined for both military and civil operation. A hundred are under construction.

• **Two-place civil plane,** to be designed along lines set by the results of a survey of the Argentine's flying clubs that now is nearing completion. The Ministry is preparing for mass production of this lightplane.

▶ **Knowhow Lack**—The aeronautical development program faces possible setbacks because of this country's dependence on imports for essential parts and metals plus a serious lack of necessary knowhow.

More than 1,400 tons of cargo—mostly aircraft engines, parts and accessories ordered by the Ministry of Aviation—arrived here from New York last month. But the continued shortage of dollar exchange does not enable IAME to purchase these in volume commensurate with even minimum production goals.

London Airport Builds $100-Million Terminal

(McGraw-Hill World News)

London—Few passengers landing at London Airport notice the island of heavy, modern construction taking place in the middle of the field. They are too startled at the dirty miscellaneous collection of temporary structures that parade in motly array as the airfield's present main terminal buildings.

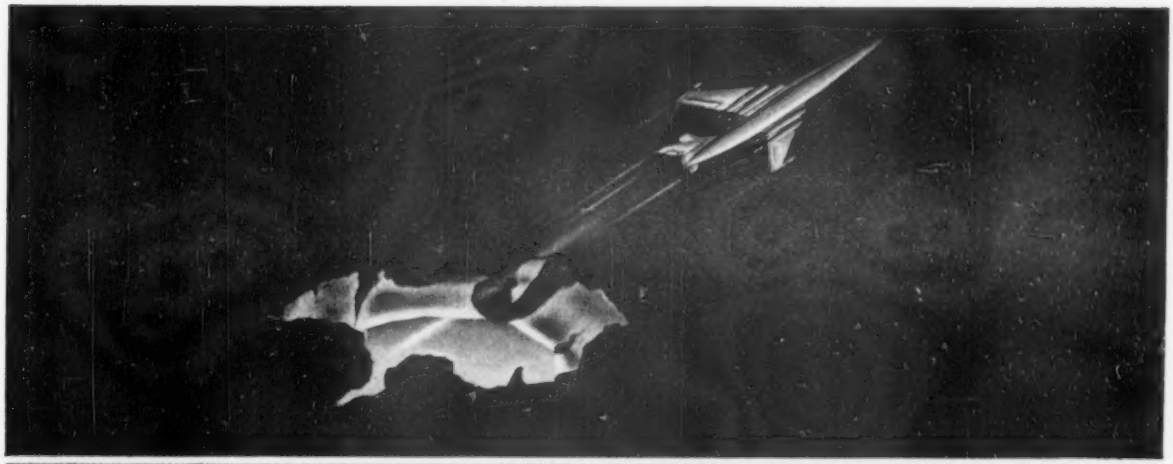
Construction of what is billed as the world's most modern air terminal—costing just under $100 million—is well advanced. The central control tower and main airport operational offices already are framed up, bricked and glassed in and are expected to go into operation near the end of this year.

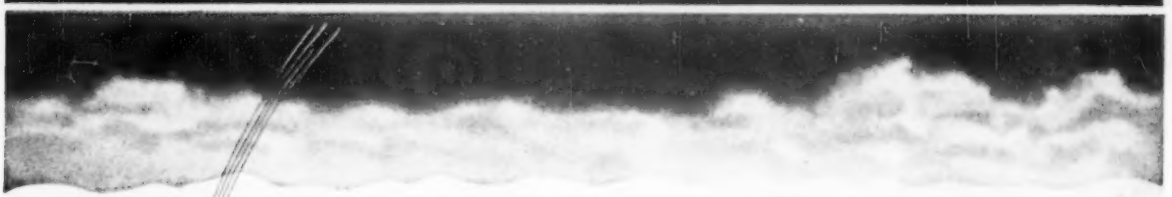
▶ **Airline Facilities**—The Southeast Face Building is about half done, with six of the 10 planned passenger channels expected to be in operation by March 1955.

The Eastern Apex Building is having its steel structure erected and is not expected to be ready for occupancy and use before December 1955. This building will house the airline's operational rooms, customs clearance for crews, and—on the roof—a new theater, exhibition hall, etc., for the general public.

▶ **Tunnel Approach**—The main terminal area, centered in the middle of the airfield, is approached through a 2,060-ft. tunnel under one of the main runways.

This tunnel is 86 ft. wide and has 23 ft. clearance in the motor vehicle





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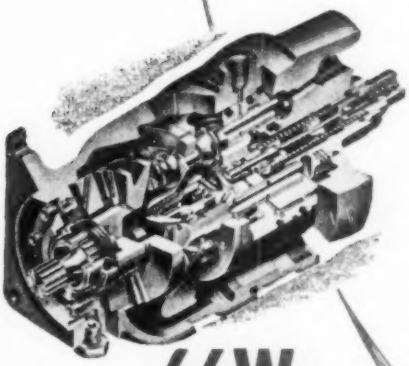

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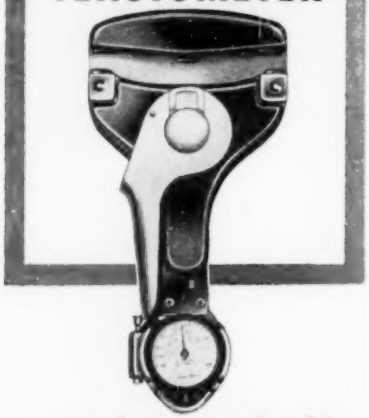

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sections. It includes one for both inbound and for outbound traffic; two 10-ft.-wide motor vehicle traffic lanes, a cyclists' lane and a foot-lane.

At peak hours, it is estimated that it can handle 2,000 motor vehicles an hour in each direction.

▶**4 Million Passengers**—By 1960 present estimates are that the terminal will have to handle 4.5 million air travel passengers a year. For this reason nearly three sides of the diamond terminal area have been left open to future detailed planning, although the general configuration of future buildings has been decided.

Because of the unique layout of the field, all four sides of the diamond face on landing or takeoff runways. London Airport is set up on a twin parallel runway system—one each for simultaneous takeoff and landing.

In addition to the tunnel, there are four vehicle subways that permit buses to take air passengers to and from aircraft parked on the far side of the apron without having to cross dangerous parking and taxiways.

Convair Official Urges Air Supply Speedup

Los Angeles—In order to do the job needed by our nation's future logistics program, emphasis should be placed on eliminating the red tape of getting men and materiel into the field and the need for speedy transportation of troops and supplies once they have been requisitioned.

Charles F. Horne, manager of the Pomona, Calif., plant of Convair Division of General Dynamics Corp., gave this warning to the Los Angeles Chapter of the National Defense Transportation Assn. at a recent meeting.

▶**Speeding the Flow**—Speaking before the group responsible for keeping the nation's transport facilities ready for any emergencies, Horne urged use of electronic memory devices to speed the flow of information and data to and from front lines as a means of reducing paper work normally handled manually.

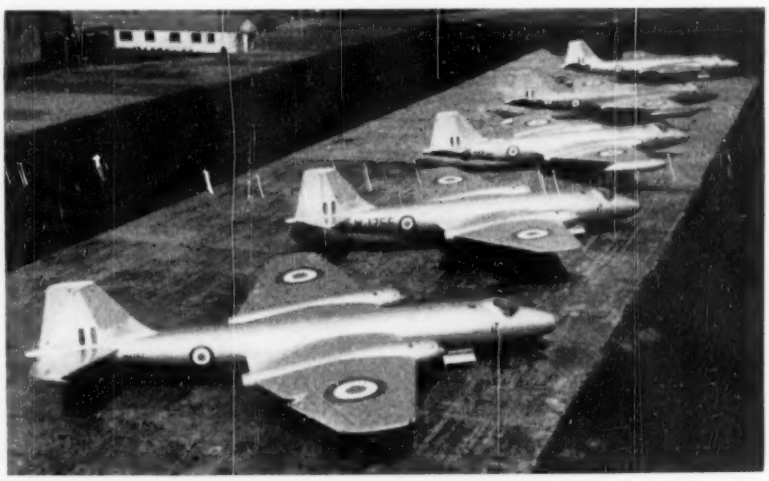
"The faster delivery of supplies by means of global transports, coupled with the speedier information flow made possible by electronic methods, will result in a great reduction in our supply pipelines," he said.

"There will be fewer days of supply, and each day's supply will be smaller. We currently need more than 200 days of supply in our worldwide pipelines to insure a day's supply to field units. Each day of supply we can eliminate—by speeding information and materiel—means savings of millions of dollars."

▶**Anticipating Needs**—Describing the electronic memory devices now under development, Horne said they virtually would eliminate paper work, reduce information flow time from months to seconds, and remove inaccuracies and inaccessibility of data.

"These machines will take a field commander's requisition to the source of supply, regardless of distance, in seconds and keep a complete check-and-balance at the same time. Moreover, under normal conditions, they will actually anticipate the commander's requirements and do the ordering for him," Horne predicted.

The electronic system, he said, would require a relatively small number of machines—probably one at each base, one at each depot and several at a



Five Canberras—All Different

Here are five different versions of the twin-jet English Electric Canberra. From foreground to rear: photo-recon. P.R.7, bomber B.6, trainer T.4, photo-recon. P.R.3 and the bomber B.2. The company produces the Canberra at Preston.

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Ask your fabricator

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...another

CRITICAL FASTENING PROBLEM

solved by Delron

problem: Lockheed engineers required a strong, lightweight bolt spacer for fast, economical installation of aluminum honeycomb structure in the famous Super Constellation. The floor construction illustrated is an example. Large quantity of fasteners to be used required low weight per unit, and had to be adaptable to mass production as well as manual installation.

solution: Delron's Fasco Spacers were tested by Lockheed and more than met requirements of this critical fastening job. On each Super Constellation, approximately 3500 Spacers are used, providing high column strength with a total weight of only 12 pounds. Fast 200 per hour mechanical sub-assembly installation as well as hand assembly, if required, are the reasons Fasco Spacers make ideal fasteners for honeycomb type structure.

This is another example of Delron's long service and design experience at work—solving critical fastening problems!

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central point to control worldwide stocks.

Such an information-flow system would process the greater portion of the functions of distribution, programming and costing.

▶ **Accent on Speed**—Along with the highspeed flow of information would be an integrated transport system comprising ships, trucks, railroad cars, buses and other vehicles with the accent on speed. They would carry standard, preloaded containers, the Convair executive said.

"We now need a heavy logistics air carrier that will fit into this integrated transportation system," Horne said. "Military characteristics for such an aircraft already have been drawn up. This airplane would be able to haul high payloads at high speeds for long distances."

Up-to-date logistics, he said, also will require less packaging, to save time, space, weight, and money.

"For certain types of combat operations," said Horne, "studies have shown that logistic air support costs are comparable to those incurred by sea-lane transportation. Thus, the overall expense in dollars and personnel of operations like these would be minimized for the highly strategic defensive and offensive capabilities possible."

He explained: "We also would effect a reduction in stockpiles of men and materiel abroad. They would be contained on our shores, ready—with fleets of globe-girdling transports—to move out men and equipment at a moment's notice."

▶ **Surprise Premium**—We must remember, he concluded, that the advent of nuclear weapons places a premium on the element of surprise; our troops must be prepared for rapid use of the airlines to go into areas while the enemy still is in condition of shock from our retaliation.

"These troops can be speedily transported either by land-based or water-based airplanes." Horne said. "To get the job accomplished, it will be aerial transportation that gets the troops and the supplies to the front 'fustest with the mostest.'"

Bell Aircraft Pays Officers $387,000

Lawrence D. Bell, president and general manager of Bell Aircraft Corp., received $83,159 salary during 1953, the firm reports to the Securities & Exchange Commission.

The company paid Ray P. Whitman, first vice president, $56,542; and Leston P. Faneuf, secretary-treasurer and assistant general manager, $50,786. All officers and directors received a combined total of $387,007.

MB-designed suspension solves "difficult engine installation"

in Sikorsky twin-engine helicopter

when retracted.

▶ **Mounted at Angle**—The main rotor assembly utilizes five blades of about 45-ft. length manufactured by a process described in AVIATION WEEK (Sept. 14, 1953, p. 11).

Engine installation is one of the most difficult yet tackled in a helicopter. The R2800 double-row piston engines are mounted at an angle to the main fuselage with the crankshaft pointing toward the main rotor assembly. Cooling air coming in through a duct in the leading edge of the stub

Reprinted from Aviation Week of January 25, 1954

New lightweight MB mounts isolate the two P&W R2800 engines

■ With two engines, the Marine Corps' new Sikorsky HR2S represents a major event in helicopter progress. But that twin power plant had also meant double trouble in mounting. Called in on the problem, MB vibration specialists engineered a successful suspension system for the angle-mounted engines. Vibration was isolated—a smooth, comfortable ride assured.

MB cooperation yielded still another benefit. The HR2S uses the new lightweight aluminum MB engine mounts developed especially for P&W R2800 engines. Their advantage? Each mount weighs 38% less than the unit it replaced.

Leadership in vibration engineering explains in part why so many manufacturers rely on MB—for engine mounts and for help in application.

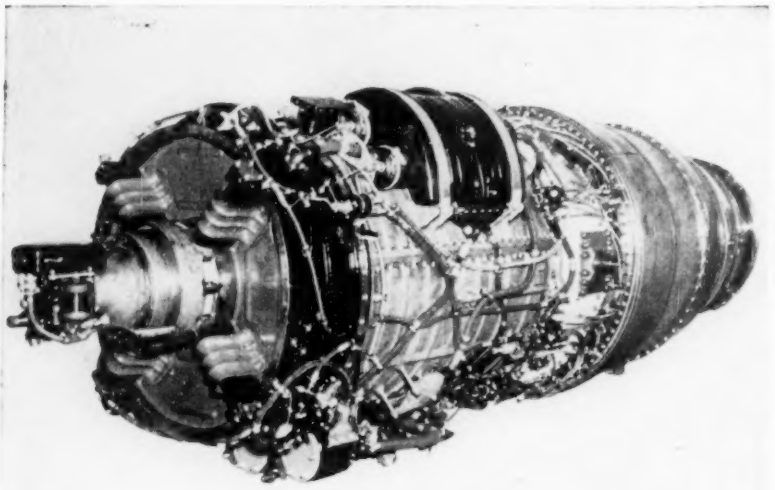
the MB manufacturing company, inc.

1060 State Street, New Haven, Conn.

HEADQUARTERS FOR PRODUCTS TO *ISOLATE* VIBRATION...TO *EXCITE* IT...TO *MEASURE* IT

Analysis Reveals Wright J65 Details

By Irving Stone



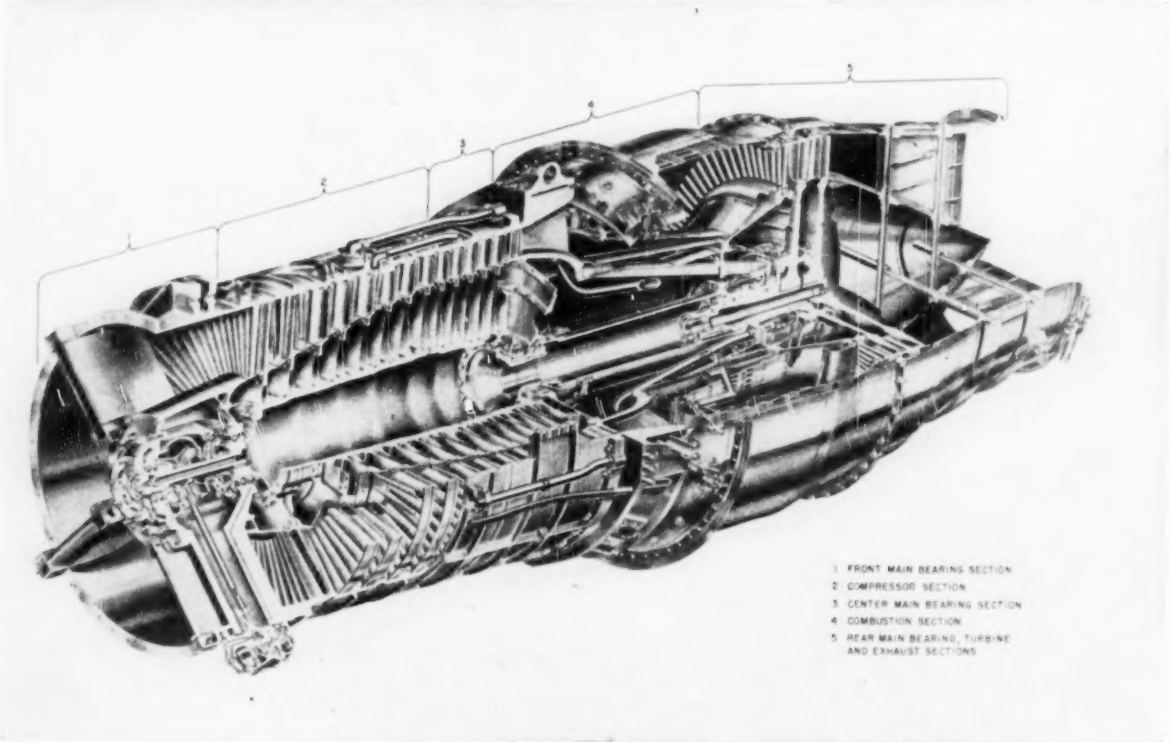
WRIGHT YJ65-W-1 external view shows equipment and lines. Based on Armstrong Siddeley Sapphire, J65 has official thrust rating of over 7,200 lb.

The J65 turbojet engine incorporates unusual design and production features, notably in the compressor and combustion chamber. Wright Aeronautical Division of Curtiss-Wright Corp., which builds the engine, has stuck very closely to the basic Sapphire engine, its British counterpart originally designed and built abroad by Armstrong Siddeley Motors Ltd.

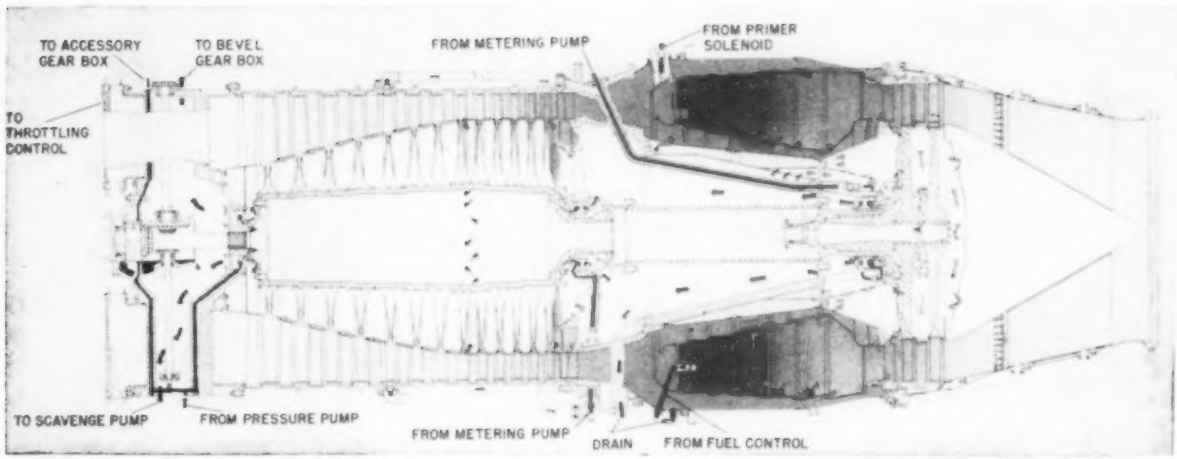
First in Wright's production series is the YJ65-W-1, the subject of this analysis. Its official thrust rating is more than 7,200 lb. Many of these engines have been built and embody changes to conform to American standards, American-built accessories, and necessary engineering and production refinements. There are other engines in the series which also generally follow the basic British design.

Buick Motor Division of General Motors Corp. also is building the J65 as prime contractor to the Air Force, under license from Curtiss-Wright Corp.

► **Critical Metals**—In some respects the


1 FRONT MAIN BEARING SECTION
2 COMPRESSOR SECTION
3 CENTER MAIN BEARING SECTION
4 COMBUSTION SECTION
5 REAR MAIN BEARING, TURBINE AND EXHAUST SECTIONS

YJ65-W-1 CUTAWAY



SCHEMATIC cross-section gives details of oil, air and fuel flow. Compressor rotor blades are root-riveted between disks.

engine offers some important savings in strategic material utilization. Thus, no cobalt is used anywhere in the engine. This material normally is associated with bucket materials as an alloying element.

No columbium goes into the engine as an alloy to gain temperature resistance, but some is used in welding rod for the center bearing support, combustion chamber and tailcone. Little tungsten is used—only in the flange support ring for the combustion chamber and tailcone, and in nozzle blading support members.

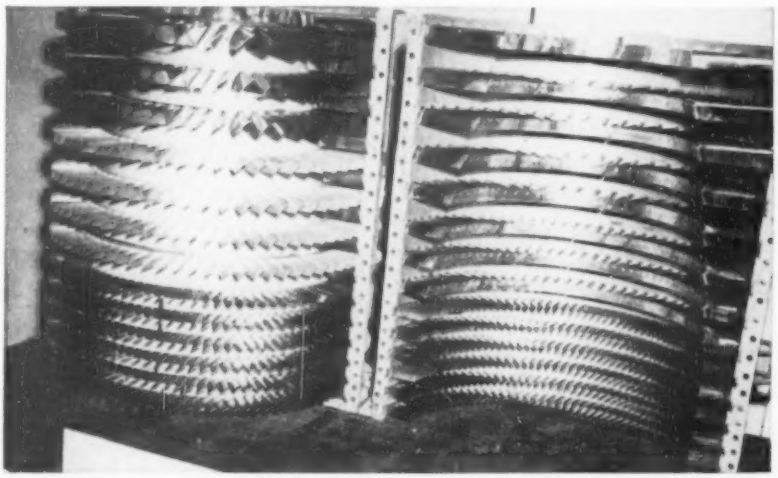
Chromium and nickel are fairly prevalent. Nickel is used in the Nimonic buckets and combustion chamber vaporizer tube, stainless steel liners, burner support, exhaust nozzle, and center bearing support. The chromium content is generally associated with parts containing the nickel.

▶ **Front End**—An outstanding feature of the engine is its large air handling capacity per square foot of frontal area. This capability is considered very good even by the latest standards. It is obtained by the compressor design, permitting the inlet and first few stages to handle air successfully at high Mach numbers.

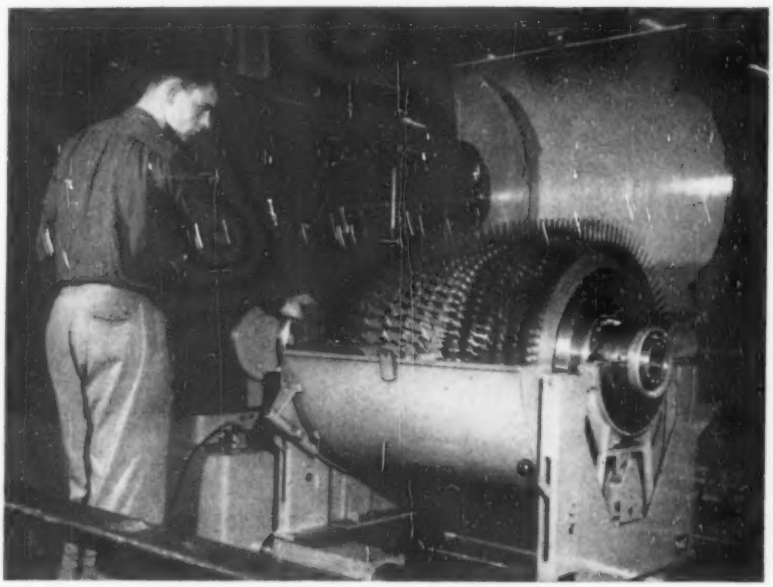
Front main bearing support forms an annular entrance to the compressor section, and is supported by four hollow struts. These extend radially from the hub, 90 deg. apart, covered with four fairings to form leading edges. The front main bearing is housed at the rear of the support.

▶ **Compressor Data**—Design of the compressor is aimed at lightweight construction. There are 13 rows of rotor blades, the first seven stages comprising the low-pressure portion of the compressor and the last six stages being the high-pressure portion.

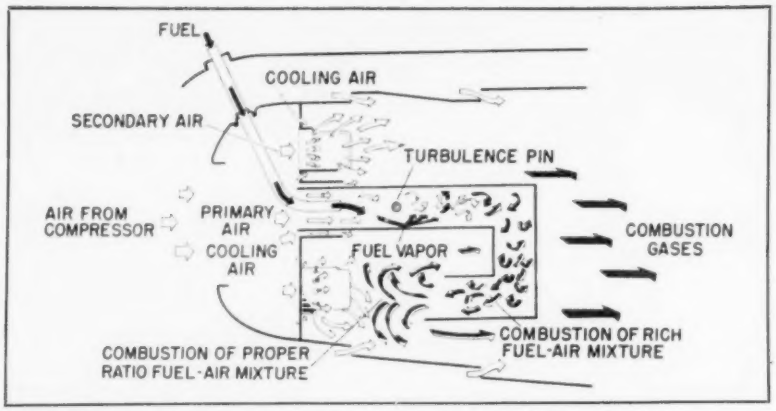
Initially, the first seven rotor blade stages were aluminum alloy, but extensive development of the YJ65-W-1



COMPRESSOR rotor (left) and stator (right). The inlet guide vane and first seven stages (low-pressure portion) of stator have tips shrouded.



ROTOR of compressor in check fixture. Note long blades at intake end (left).



SECTION shows fuel and air flow in vaporizing tube and combustion chamber.

has led to installation of steel rotor blades in the first three stages of the compressor to provide higher strength for higher air loads. This has involved a modification of the disks in order to take a fir-tree root instead of the compressor's basic blade retention scheme. Last six stages of the rotor are Type 403 stainless.

Rotor shaft is a hollow aluminum alloy unit about 10 in. in diameter, carrying twin-type steel disks shrunk on the shaft and fitted together by means of slots. A coupling is used between disks in the first and second stages and the third and fourth stages. The rotor blades are retained between each pair of disks by rivets (two per blade).

▶**Stator Details**—The inner surface of the compressor housing is slotted to accommodate carrier rings used for inlet guide vanes and each row of stators. The rings are split to facilitate assembly in the compressor housing, and a key riveted into the end of each carrier ring segment prevents rotation of the assembly and the stator blade.

Stator blades are grooved at their base (outer end) to fit into grooves in carrier ring on compressor housing.

Inlet guide vanes and the first seven rows of stators, because of their length, are shrouded at their inner (tip) ends. These stators are fitted with lugs which fit into rectangular holes in the shroud pieces, and the blades are brazed to the shrouds.

Air from the final compressor stage passes through two straightening vanes which remove the tangential components of compressor flow.

From the two vanes the air enters the diffuser.

▶**Bearing Support Redesign**—The diffuser section is integral with the center main bearing support housing. Modification of this bearing support was the biggest job Wright encountered in readying the engine for production according to American practices (AVIATION WEEK Dec. 22, 1952, p. 21).

Located about midway in the engine, the support is a key part of the engine structure. Two trunnions attached to it carry almost the entire weight of the engine, also absorb all flight maneuver loads. It houses the center roller bearing which carries the stub shaft bolted to the main compressor shaft.

The British design incorporated a support which was practically carved out of an aluminum pancake forging 38 in. in diameter, 11 in. thick. Wright's analysis indicated that at

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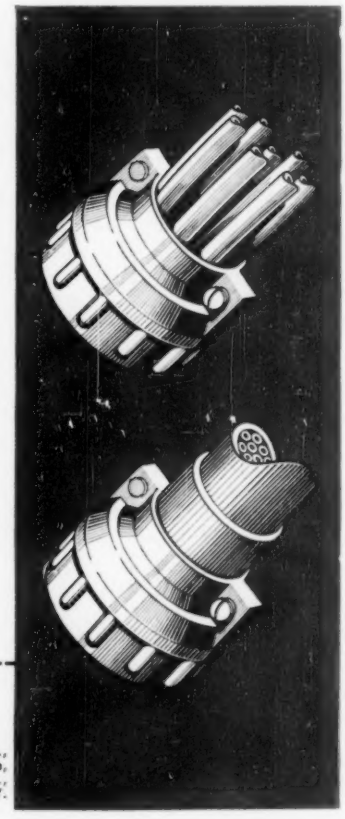

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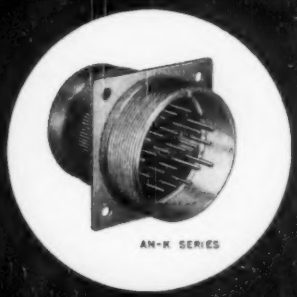
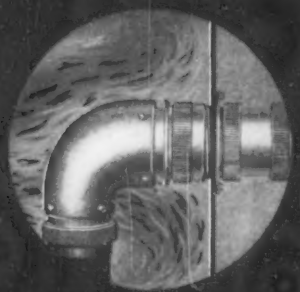


AN-K SERIES



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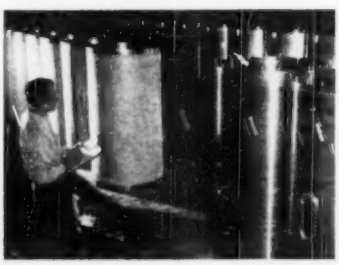
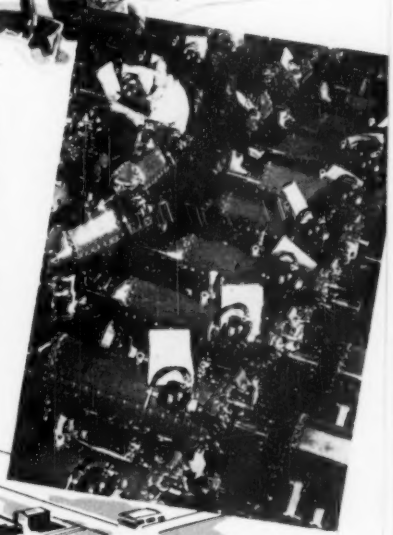
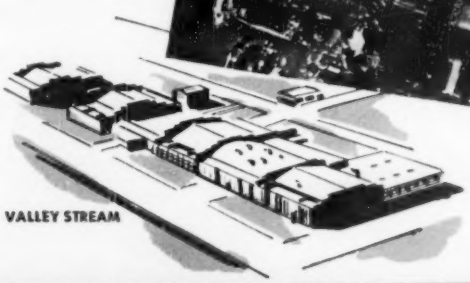


Proficiency in fabrication of sheet metal for Fairchild's J44 turbojet cowlings, combustion chambers and nozzles.





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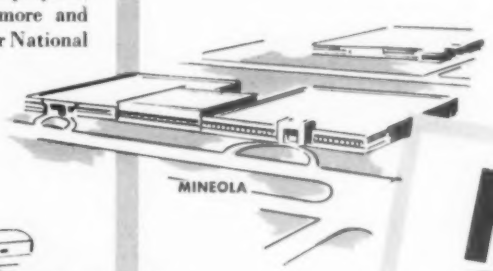

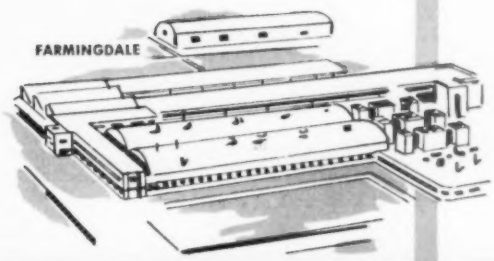

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Wright J65 History

Curtiss-Wright obtained license to build the Armstrong Siddeley Sapphire and arranged for a long-term engineering agreement with AS in the fall of 1950. The Sapphire had passed the British 150-hr. model test.

Wright's initial effort was to redesign the engine a minimum amount to satisfy American military accessory requirements and Wright's own production requirements.

Redrawing and modification proceeded from Dec. 1950 to Mar. 1951. The resulting engine became Wright's YJ65-W-1.

First fighter plane to fly with the YJ65-W-1 was the Republic XF-84F at Edwards AFB, in February 1951—four months after the first tool-trial engine was completed. The engine contained some British parts.

The first production F-84F flew Nov. 22, 1952, also powered with a YJ65-W-1 engine. The engine also flew in a North American FJ-3 prototype in September 1953, and in the first production FJ-3 on Dec. 11, 1953.

Glenn L. Martin's B57 is powered with a Buick-built J65 engine. First flight for this combination was in July 1953.

In addition, the J65 has been specified for use in four other military aircraft projects of classified status.

The J65 is now in mass production for the USAF and Navy, and aircraft powered by the engine are in service operation at a variety of Air Force bases.

American labor rates, cost of making the part from an aluminum contour forging would be impractical. Kellering time for each part would be about 700 hr. This would mean that one duplicating machine on a three-shift basis would produce less than a single unit per month. Also, since temperature on the part might run as high as 450-500F at sea level highspeed flight, aluminum alloy wasn't considered the best material.

Wright's redesign broke the parts into an inner and outer ring cast from nodular Ni-Resist (International Nickel Co. development), connected by 10 stainless steel sheet metal struts welded to the rings.

Wright has produced the part for approximately one-fifth of the original cost in the redesign version for large-scale producibility. Reports are that no trouble has been encountered in service. However, some difficulty is still experienced in casting the inner and outer rings to the tolerance, it is said.

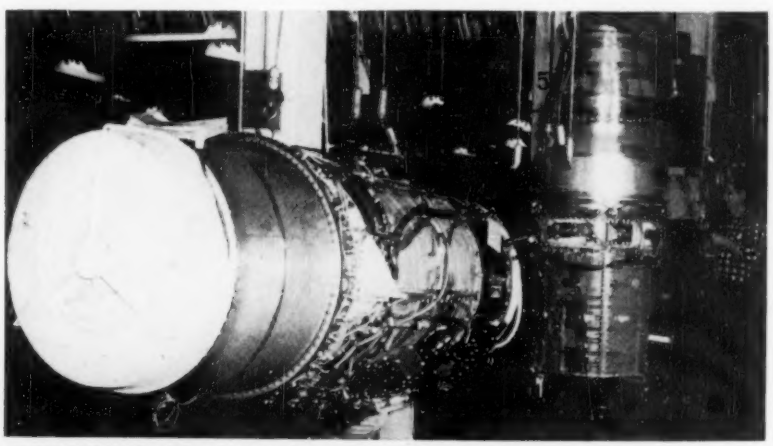
▶ **Annular Chamber**—The combustion chamber is an annular type. The entire combustion section is comprised of the inlet housing, the combustion chamber housing, outer liner, inner liner, heat shield, rear main bearing cone, and the burner support on which the primary air-and-fuel tubes and secondary air distributing cups are mounted.

Chamber outer liner is a cylinder made up of a series of sections with corrugated stiffeners between. The assembly is welded together. Third and fourth sections have rectangular air holes, while the fifth section has circular air holes.

Combustion chamber inner liner is a cone-shaped unit formed by a series of sections with corrugated stiffeners between. Third and fourth sections of the inner liner have rectangular air holes.

Combustion occurs in the space between the inner and outer liners.

A support plate makes up the front wall of the combustion chamber. Mounted on its rear face are 36 primary air-and-fuel tubes, which have a hook shape similar to a cane head. Also supported on the rear face of this plate



ASSEMBLY PLATFORM (right) rides in pit, to keep work at convenient level.

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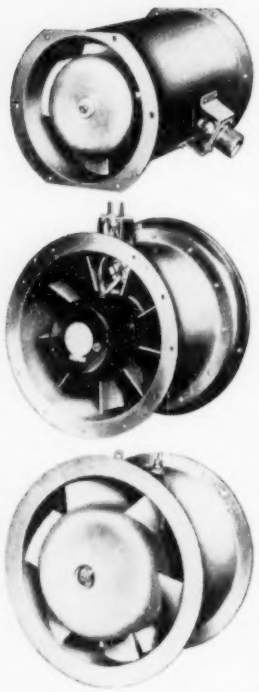

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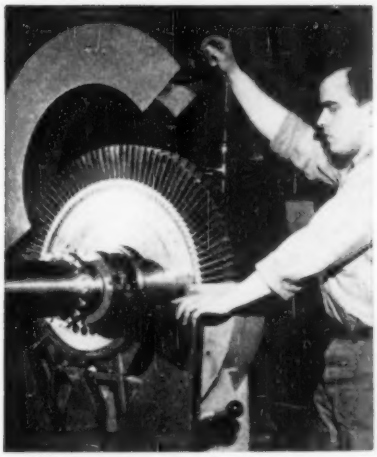


TWIN TURBINE wheels in check rig. Bucket roots are fir-tree type.

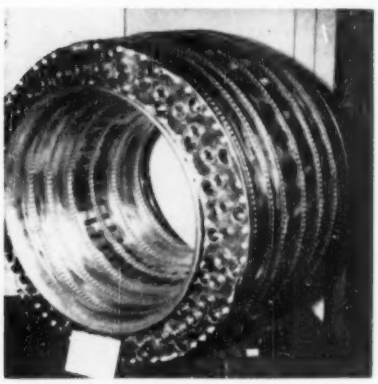
are 36 secondary air distributing cups, 18 on the inner edge and 18 on the outer edge.

Within the combustion chamber inner liner is located a heat shield surrounding the shaft between turbine and compressor. Front end of this heat shield is supported by the rear face of the center main bearing support housing. This housing also supports the front end of the rear main bearing support cone assembly which also is located within the combustion chamber heat shield.

▶ **Vaporizing Cane Heads**—The vaporizing system used in the J65 is basically different from that used in U.S. designs. Fuel is mixed by vaporization only. There is no mixing of fuel and air by mechanical atomization with spray nozzles or other orifices.

Fuel passes through 36 tubes installed on the combustion chamber inlet housing. These tubes terminate inside the 36 corresponding primary air-and-fuel tubes, which their open, hooked end pointing upstream.

Fuel pressure in the tubes feeding



ANNULAR combustion chamber's front wall carries 36 primary fuel-and-air tubes (center) between 36 secondary air distributing cups (outer rows).

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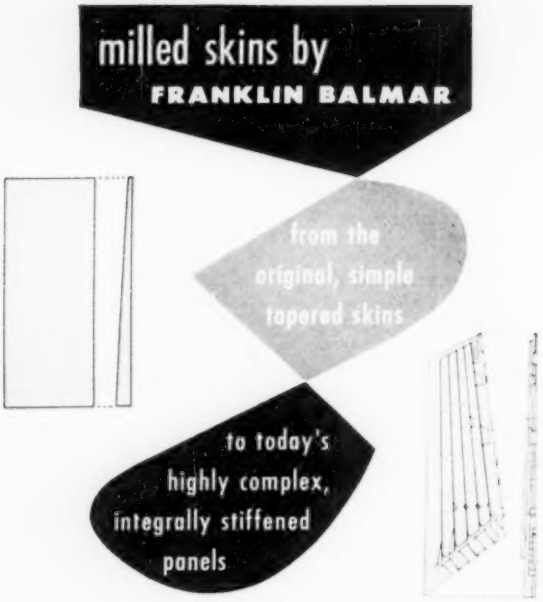
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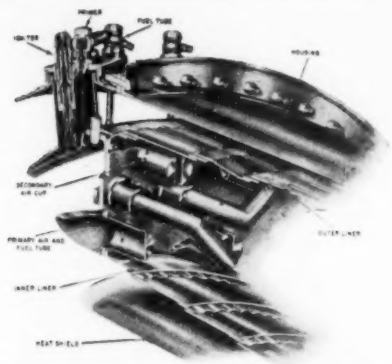

COMBUSTION chamber detail shows relation of primary air-and-fuel (vaporizing) tubes and secondary air cups.

into the primary air-and-fuel (vaporizing) tubes is only sufficient to insure that the proper quantity of fuel will flow into the combustion chamber against the pressure inside the vaporizer tube. Ability to operate at comparatively low maximum fuel pressure makes possible good combustion efficiency at high altitude where the weight of air per second fed to the combustion chamber is relatively small and where a correspondingly low fuel flow only is required, keeping the temperature of the chamber within limits.

Primers and ignitors start combustion. Primers discharge fuel just ahead of the vaporizer tube support plate. Hence, for the first few seconds both primer and main fuel tubes are in operation. The vaporizer tubes are thoroughly heated by the combustion flame, so that liquid fuel flowing in is vaporized on contact with the inside wall of the tube. Tube design is such that its operating temperature is sufficiently high to provide complete vaporization of the fuel without cracking and excessive carbon formation.

The rich mixture emerging from the tube into an area of high turbulence is thoroughly mixed with sufficient air for complete combustion in a short period of time.

► **Secondary Air**—Secondary air, entering the combustion chamber through the 36 air distributing cups, mixes with the combustion flame near the vaporizer tubes, diluting it to insure combustion stability and high combustion efficiency.

A slot in each of the secondary air distributing cups, as well as cup arrangement relative to the end of the vaporizer tubes, promotes best mixing of the secondary air and flame.

Inner and outer liners of the combustion chamber are protected from overheating and hot spots by cooling air flowing through slots and holes in the liner.

► **Turbine Data**—Turbine section is a

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two-stage unit. First-stage stator blades are bolted to a stator inlet ring and second-stage stator blade support. Tips are held in a blade-support ring. This support ring is located on the rear end of the first-stage stator blade support assembly, which is attached to the rear flange of the rear main bearing support cone.

Second-stage stator blades are dowel-pinned to blade-retaining ring to form sections which are bolted to the second-stage stator blade support and the second-stage rotor blade shroud. In each row of stators are 108 blades.

First-stage turbine has 110 buckets, second stage has 75 buckets. Buckets are held to the turbine disks by fir tree roots and lock plates. Second-stage turbine rotor disk is coupled to the first-stage disk with taper pins.

First-stage turbine rotor disk is coupled to the turbine rotor rear shaft with taper pins. Front end of the turbine rotor rear shaft is splined to the turbine rotor shaft coupling. Bolted to this coupling is the turbine rotor front shaft, and bolted to the front end of the latter is the compressor rotor shaft drive coupling.

Inner cone of the exhaust section is supported by four transverse tubes enclosed in airfoil fairings, arranged at 90 deg. to each other. These tubes and fairings are supported by the outer exhaust cone.

The tubes allow inner cone to expand or contract radially and move in the fore and aft direction, to a limited extent, with respect to the outer exhaust cone.

► **Bearing, Turbine Cooling**—Bearing cooling is done with air bled from the fifth stage of the compressor. Air passes through external lines from the compressor section to the center main bearing support and through internal lines from that point to the center and rear main bearing. It goes around the bearing, meets the oil coming out of the bearing where it is formed into an air-oil mist. It is then discharged from vapor manifolds on the center main bearing support housing and dumped overboard.

Turbine cooling is by air passing through from the spaces around the combustion chamber inner and outer liner.

Air also is bled from the eighth compressor stage through holes in the compressor rotor shaft to the inside of the compressor and turbine shaft. It goes out through holes in the turbine shaft between the first and second stage turbine disk and out through the end of the turbine shaft.

Three air bleeds are located on the center bearing support housing to take thirteenth stage air for cabin pressurization and other airplane uses.

► **Oil Scheme**—Engine oil tank is mounted near the top of the compressor housing and is supplied as an integral part of the engine. This feature simplifies development and installation problems associated with a suitable oil supply system.

Oil from the tank is delivered through an external line to the oil pumps, mounted on the lower left side of the front main bearing support. There is one gear-type pressure pump, a gear-type scavenge pump, and two piston-type oil metering pumps. Pump drive is by beveled gearing in the accessory drive power take-off housing located in the front main bearing support.

Oil pump driveshaft passes through strut No. 3 and is splined into the scavenge pump shaft. An intermediate gear on the scavenge pump shaft drives a camshaft gear which, in turn, drives the pressure pump gear. The camshaft actuates the piston-type oil metering pump.

While the center and rear bearings have a total-loss oil system, a circulating system is used for front bearings.

► **Fuel Highlights**—In the fuel system, the booster pump is an engine-driven unit consisting of a centrifugal impeller pump on an integral shaft with a rotor-vane-type pump. An adjustable relief

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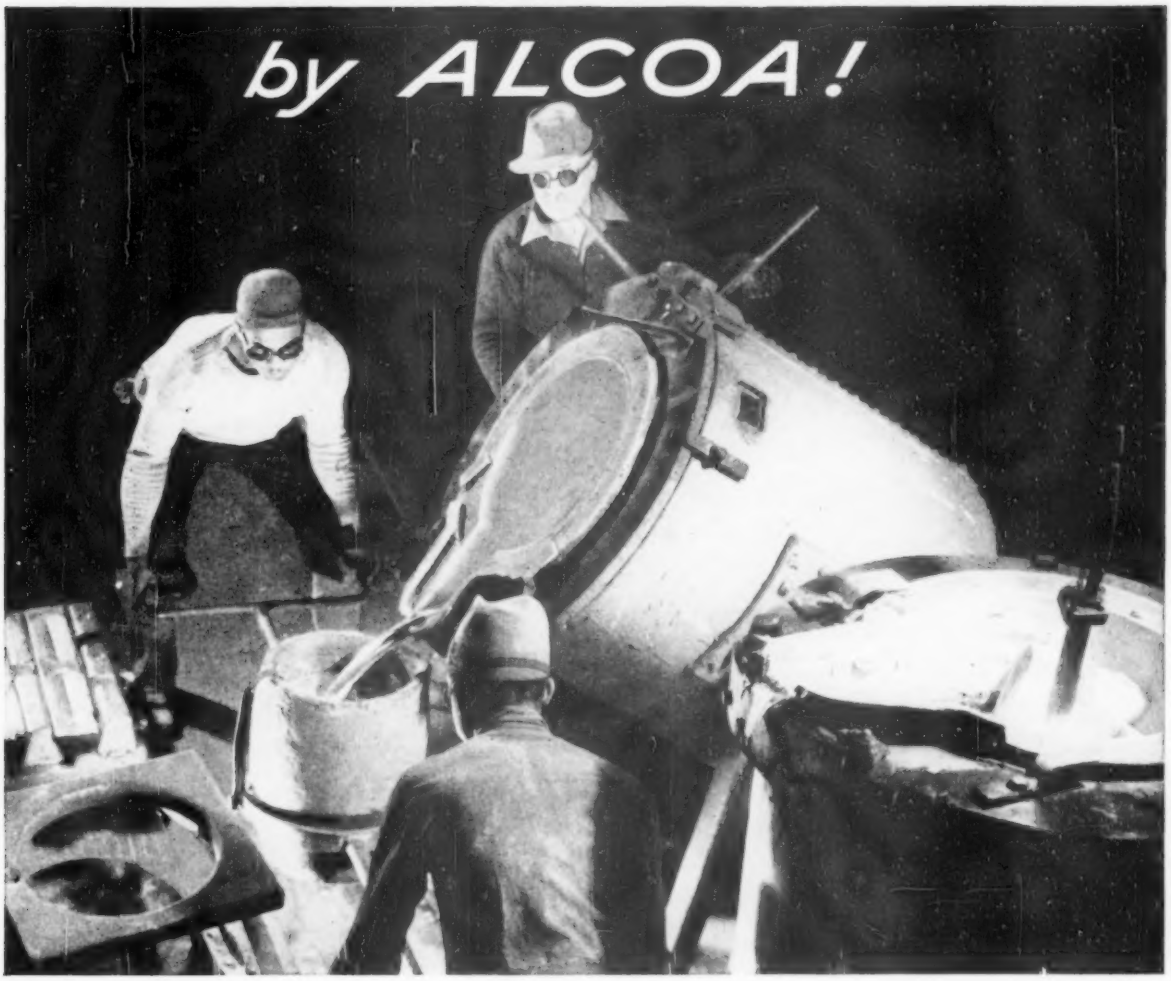

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valve incorporated in the system to provide for pressure regulation.

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A turbine fuel control incorporates a filter, acceleration control, throttling control, and pressurizing valve.

► **Starting**—Electrical starter, primers, and ignition systems are all interconnected so that the engine start is automatic.

After the engine is running, the starter becomes the generator and the primers and ignition system are de-energized by a timing unit which permits them to operate for a period of only 20 sec.

The starter is housed in a bullet fairing on the engine nose.

Windtunnel Experts Form Organization

A working-level conference on windtunnel operations and techniques was held recently at the Ordnance Aerophysics Laboratory, Convair's Daingerfield, Tex., test facility.

Recognizing the lack of an organization where operating personnel of the many supersonic windtunnel facilities could discuss problems and techniques, R. J. Volluz, chief of the OAL supersonic tunnel took the lead to collect such a group.

Representatives of all major supersonic test facilities in the country were invited to Daingerfield to form such an organization and to hold some preliminary discussions.

Volluz was named chairman, with I. M. Nestingen of Naval Ordnance Lab designated corresponding secretary and E. B. May of Redstone Arsenal as recording secretary.

Technical sessions of the conference featured presentations on techniques of nozzle calibration, automatic recording of pressure measurements and automatic windtunnel operation.

Represented at the conference: Aro, Inc.; Ballistics Research Laboratory; Cooperative Windtunnel; Cornell Aeronautical Laboratory; David Taylor Model Basin; Jet Propulsion Laboratory; Naval Supersonic Laboratory; Wright Air Development Center.

Also represented: U. S. Naval Air Missile Test Center; Naval Ordnance Laboratory; North American Aviation, Inc.; Redstone Arsenal; United Aircraft Corp.; University of Michigan, and University of Minnesota.

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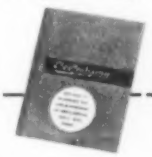

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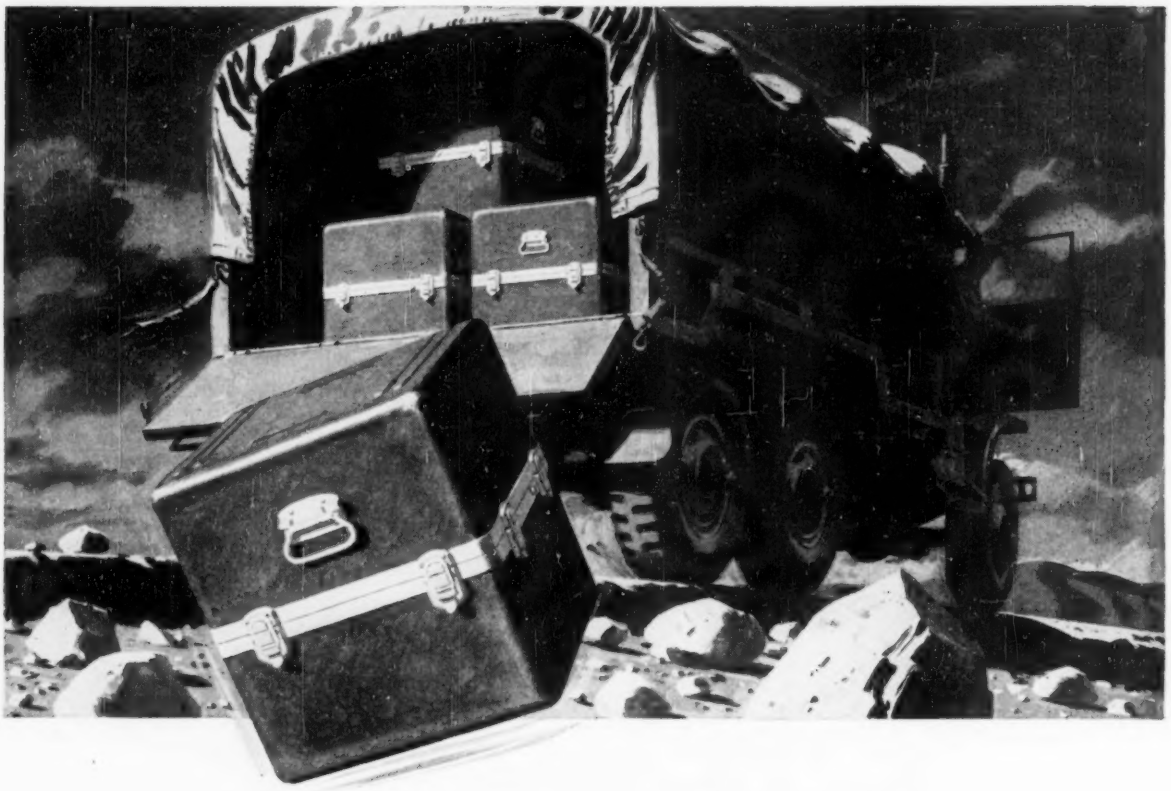

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Navy Contracts

Contracts recently announced by the Navy's Aviation Supply Office, 700 Robbins Ave., Philadelphia 11, are:

AiResearch Mfg. Co., 9851-9951 Sepulveda Blvd., Los Angeles 45, retrofit kit and items for same, $53,801.

Bendix Products Div., Bendix Aviation Corp., 401 Bendix Drive, South Bend 20, Ind., maintenance parts to overhaul pumps, $46,621; carburetor, 300 ea., $295,908; brake assy., 193 ea., $68,942; brake and wheel assys. and maintenance parts for same, $28,331; strut and wheel assy., $30,505.

Breeze Corp., Inc., 41 South 6th Street, Newark 7, N. J., actuator and screw-jack, $40,539.

Burner-Hollomon Mfg. Corp., 4706 Rhode Island Ave., Hyattsville, Md., engine overhaul stand, 34 ea., $59,806.

Cleveland Pneumatic Tool Co., 3781 E. 77th St., Cleveland 5, Ohio, maintenance parts for HSL-1 aircraft, $114,366.

Clifford Mfg. Co., div. of Standard Thomson Corp., 152 Grove St., Waltham, Mass., oil cooler, 227 ea., $64,695.

Consolidated Tool & Products Co., 2430 E. 23rd St., Los Angeles 58, cradle, light-weight, 21 ea., $37,273.

Delavan Mfg. Co., 811 Fourth St., West Des Moines, Iowa, items of nozzle parts for P&W engines, $68,290.

Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., power amplifier and transmitter, $36,321; generator and relay protector, $282,094.

Electrol Inc., 85 Grand St., Kingston, N. Y., items and spare parts for valves, $33,387.

General Electric Co., 1405 Locust St., Philadelphia 2, Pa., ammeter, 1,070 ea., $25,520.

R. M. Hollingshead Corp., 840 Cooper St., Camden 2, N. J., plastic coating, 59,439 gal., $135,084.

Hydro-Aire Inc., 3000 Winona Ave., Burbank, Calif., 5 items of valves and spare parts for same, $56,864.

International Business Machines Corp., 7800 Ogontz Ave., Philadelphia, Pa., services and material for federal cataloging program, $29,218.

JBT Instruments, Inc., 441 Chapel St., New Haven 8, Conn., frequency meter, 1,320 ea., $25,648.

Koehler Aircraft Prods. Co., Inc., 814 Vermont Ave., Dayton 4, Ohio, valve drain, $42,755.

Lavoie Laboratories, Inc., Morganville, N. J., oscilloscope, 126 ea., $271,444.

Lord Mfg. Co., 1635 West 12th St., Erie, Pa., mount and maintenance parts used on mount for HSL-1 aircraft, $53,833.

Mar Vista Engineering Co., 5420 W. 104th St., Los Angeles 45, hydraulic valve assy. and spare parts, $142,383.

New York Air Brake Co., Watertown, N. Y., parts for 67B200-1 pump, $35,507.

Palmer Electric & Mfg. Co., Wakefield, Mass., electrical outlet box, 612 ea., $31,891.

Regent Jack Mfg. Co., 11905 Regentview Ave., Downey, Calif., jacks, $140,391.

Smith Nelson Corp., 36 E. Mason St., Santa Barbara, Calif., jacks, $35,693.

Spencer Thermostat Div., Metals & Controls Corp., 34 Forrest St., Attleboro, Mass., circuit breaker, 10,871 ea., $46,963.

Sperry Gyroscope Co., div. of The Sperry Corp., Great Neck, L. I., N. Y., force link, 76 ea., $25,029.

Superior Paint & Lacquer Works, 6231 Maywood Ave., P. O. Box 271, Huntington Park, Calif., paint, fire-retardant, 63,500 gal., $117,580.

Turco Products Inc., 95 Fairmount Ave., Philadelphia 22, Pa., cleaning compound, $27,403.

Westinghouse Electric Corp., 3001 Walnut St., Philadelphia 4, Pa., contactor, circuit breaker, $214,907; engine spare parts for various engines, $21,201,280.

Wm. R. Whittaker Co. Ltd., 915 N. Citrus Ave., Los Angeles 38, Calif., hydraulic valves, $80,470; valve assy., 342 ea., $26,163.

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with broad experience in missile proposal work and systems analysis. The positions also require experience in missile design, electronics, communications, microwave techniques, systems evaluation, airframe design, aerodynamics, structures and mechanics.

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Dear Sir: Please send me information on the Missile Systems Division.

name

field of engineering

street address

city and state

USAF Contracts

Following is a list of recent USAF contracts announced by Air Materiel Command.

Baush & Lomb Optical Co., 635 St. Paul St., Rochester 2, N. Y., rectifier, photogrammetric, spares and engr. and maint. data, 35 ea., $612,882.

Electronics Div., Curtiss-Wright Corp., Carlstadt, N. Y., prototype, production, 3 ea.; models, trainer, flight simulator, 1 ea., $2,780,178.

Flight Refueling, Inc., Friendship Arpt., Baltimore, facilities, production of automatic hose reel assys., $586,700.

General Electric Co., Evendale, Ohio, conversion of test cells, install. of test equip. for eng., $800,000.

Goodyear Tire & Rubber Co., 1144 E. Market St., Akron 16, wheel assys., 160 ea., brake assys., 160 ea., $92,042.

Graflex Inc. 154 Clarissa St., Rochester 8, N. Y., adapter assy., 514 ea., case, 100 ea., back assy., 2 ea., $38,228.

Grimes Mfg. Co., Urbana, Ohio, light assys., $113,503.

Hughes Aeft. Co., Culver City, Calif., facilities for missiles and missile sys., $2,462,609.

Link Aviation, Inc., Binghamton, N. Y., trainer, flexible gunnery, engr. data, handbook etc., 22 ea., $87,615.

Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky., chaff, 6,996 ctn., $433,528.

Solar Aeft. Co., Des Moines, facilities-production of J71 eng. comp., $200,000.

Westinghouse Elec. Co., 32 N. Main St., Dayton, Ohio, facilities, production of prototypes of G-20 ground contr. equip., $150,000; generator, 274 ea., 233 ea., 174 ea., $622,397; voltage regulators, 82 ea., 461 ea., $92,965.

Willys Motors Inc., 12801 E. Jefferson Ave., Detroit 15, increase of spare parts, $750,790.

Emerson Radio and Phonograph Corp., 111 Eighth Ave., New York, N. Y., shoran trainer, 1 ea., shoran tng. set, 10 ea., maint. and engr. data, $1,199,345.

Fairchild Aircraft Div., Fairchild Engine and Airplane Corp., Hagerstown, Md., MTU C-119-10, 1 ea., $102,888.

Fletcher Aviation Corp., 190 W. Colorado St., Pasadena, Calif., spare parts for fuel tanks, $121,415.

General Electric Co., 1 Jimson Rd., Cincinnati 15, Ohio, special tools and ground handling equipment, $100,000.

B. F. Goodrich Co., Winters Bank Bldg., Dayton 2, Ohio, increase in total contract price, $71,550.

Guardian Elec. Mfg. Co., 1621 W. Walnut St., Chicago 12, Ill., tester, flight circuit, 349 ea., transit cases, 48 ea., $266,458.

Kollsman Instr. Corp., 80-08 45th Ave., Elmhurst 73, N. Y., altitude transmitters and spare parts, 101 ea., $45,442.

Lear, Inc., 110 Ionia Ave., N.W., Grand Rapids 2, Mich., spare parts-adapters, shaft assys., screw-jacks, 6,020 ea., $69,575.

Link Aviation, Inc., Binghamton, N. Y., spare parts for F-89D simulator, $205,721.

Chicago Aerial Survey Co., 332 South Michigan St., Chicago 4, Ill., printer, 21 ea., $34,041.

Magnavox Co., 2131 Bueter Rd., Fort Wayne 4, Ind., connector, rocket, 244,209 ea., $163,620.

Mitchell Camera Corp., 666 W. Harvard St., Glendale, Calif., camera, 70-mm., 5 ea., $62,927.

Park Industries, Inc., 4328 Oakwood, Melvindale, Mich., heater, gun, cal. 50, type J-4A, 69,482 ea., $181,242.

Radioplane Co., Van Nuys, Calif., aerial targets, data, spare parts, $3,541,778.

Sperry Gyroscope Co. Div., Sperry Corp., Great Neck, L. I., N. Y., tools and equip., tng parts, $50,000.

Chris J. Van Eyk, Seaboard Elec. Co., 417-421 Canal St., New York, N. Y., servo control, 298 ea., $42,638.

Warren Corp., 2901 Brighton Rd., Pittsburgh 12, Pa., processing machine, $54,433.

Weston Electrical Instr. Corp., Newark, N. J., thermometer, self-indicating, 7,300 ea., $35,624.

PRODUCTION BRIEFING

▶ **Lockheed Aircraft Service,** New York, is overhauling, preserving and packaging Navy WV-1 and WV-2 Constellation components for Navy's Aviation Supply Office. Navy is also using LAS-N.Y. to overhaul and test an undisclosed number of instruments. LAS-Burbank has been awarded an Air National Guard contract to inspect and repair, as needed, an undisclosed number of Lockheed F-80 jet fighters. Contract approximates $3.5 million.

▶ **Perkin-Elmer Corp.,** Norwalk, Conn., has received a $2,520,000 USAF contract for 300 new-type high-altitude photo-reconnaissance camera lenses.

▶ **Aviation Developments, Inc.,** maker of blind rivets, quick-release pins and sheet grippers, is completing a new building at 210 South Victory Blvd., Burbank, Calif.

▶ **Revere Corp. of America,** precision instruments maker, has opened plants in Florida and Washington to be operated by newly established subsidiaries: Southeastern Instrument Co., Ft. Lauderdale, and Revere Instrument Co., Bellevue, near Seattle.

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NOW DE-GREASED for super-protection! The original Protective Metal Closures by Tubing Seal Cap, Inc. offer assurance of maximum efficiency by coming to you clean, clean, clean. DE-GREASED!

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New Cessna 195 Offers Greatest Room, Luxury in Single-Engine Field . . . 12 All-New Features!

Fly it! Compare it! The one *and only* airplane that offers *both* 5-passenger convenience and single-engine economy—brilliant new Cessna 195! It's powerful! Cruises over 165 m.p.h.! Offers greater comfort than any other single-engine ship! Twelve new features including 50% increase in flap area, larger tail surfaces for easier control, smoother flight, new interior color combinations. For information, see nearest Cessna dealer (listed in yellow pages of phone book) or write CESSNA AIRCRAFT CO., DEPT. AE-2, WICHITA, KAN.

Cradled Comfort

Relax in extra-soft foam rubber seats . . . stretch your legs out *full length* . . . enjoy complete comfort! Four fresh-air ventilators; a large thermostatically controlled heating system; entire cabin area is soundproofed. And for a smoother ride, you sit beneath the wing, out of the sun, with a "control tower" view of the scenery below.

Cessna
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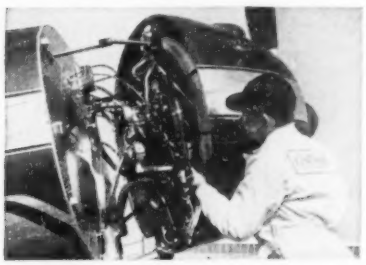
Equipped with "Crosswind" Wheels

For safest, smoothest takeoffs and landings . . . standard equipment on the Cessna 195! Eliminates need for lining-up carefully on the runway during landings. Lets you take off easily, safely even when wind is at right angles to the runway!

Hinged Engine Saves Hours



Remove 2 bolts and the Cessna 195 engine swings out for immediate maintenance! You have a choice of two engines: a 300 H.P. Jacobs or a 275 H.P. Jacobs. Both powerful, economical, service-proved, and equipped with Dynafocal shock absorbers for smoother performance.

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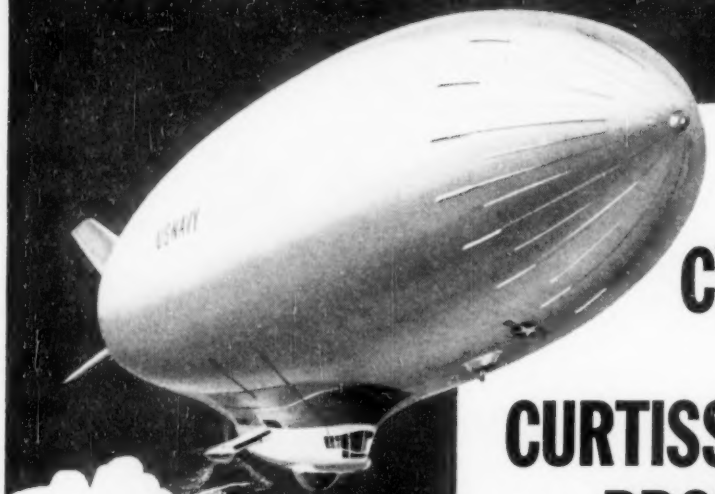
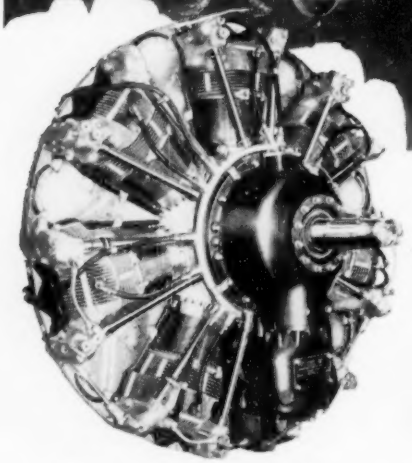
U.S. NAVY SETS A NEW WORLD'S RECORD

with

WRIGHT CYCLONE 7's and CURTISS ELECTRIC PROPELLERS

in a GOODYEAR ZPG-2 Blimp





200.2 hours aloft without refueling!

Remaining aloft and cruising steadily for well over a week, a U.S. Navy blimp ZPG-2 – with a Curtiss-Wright engine-propeller "power team" – has set a new world's record of 200.2 hours for a non-stop flight of aircraft and crew without refueling.

The Navy's fleet of NAN type non-rigid airships, largest in the world, designed for long duration defense patrol, are each powered by two 800 h.p. Wright Cyclone 7 engines, housed within the car. On outriggers, and driven by the engines through a special transmission system, are two 16' 7" Curtiss Electric Propellers with hollow steel blades. The inherent features of the Electric Propeller make it completely controllable through all ranges of pitch from feather through the forward operating range to hover and reverse pitch. During prolonged patrols with this unique installation it is possible to use both engines for full power or to use either engine alone to drive both propellers for economical search operations.

Like this record-setting ZPG-2, all U.S. Navy lighter-than-air craft in service are equipped with Curtiss Electric Propellers.

CURTISS-WRIGHT

CORPORATION • WOOD-RIDGE, N. J.

JOBS FOR: ENGINEERS • TECHNICIANS

Boeing Opens Giant Flight Test Facility

New Seattle establishment uses latest ideas to speed collection and analysis of data on highspeed jet and turboprop aircraft.

FLIGHT TEST meeting is called by chief, "Tex" Johnston (head of table).

CONTROL ROOM of new flight test hangar looks down on first production B-52A.

By William J. Coughlin

Seattle—An expanded flight test program on new jet and turboprop planes that will be one of the heaviest in the history of the industry opens as Boeing Airplane Co. begins operation of a $5-million facility here. The setup is one of the largest and most modern in the nation.

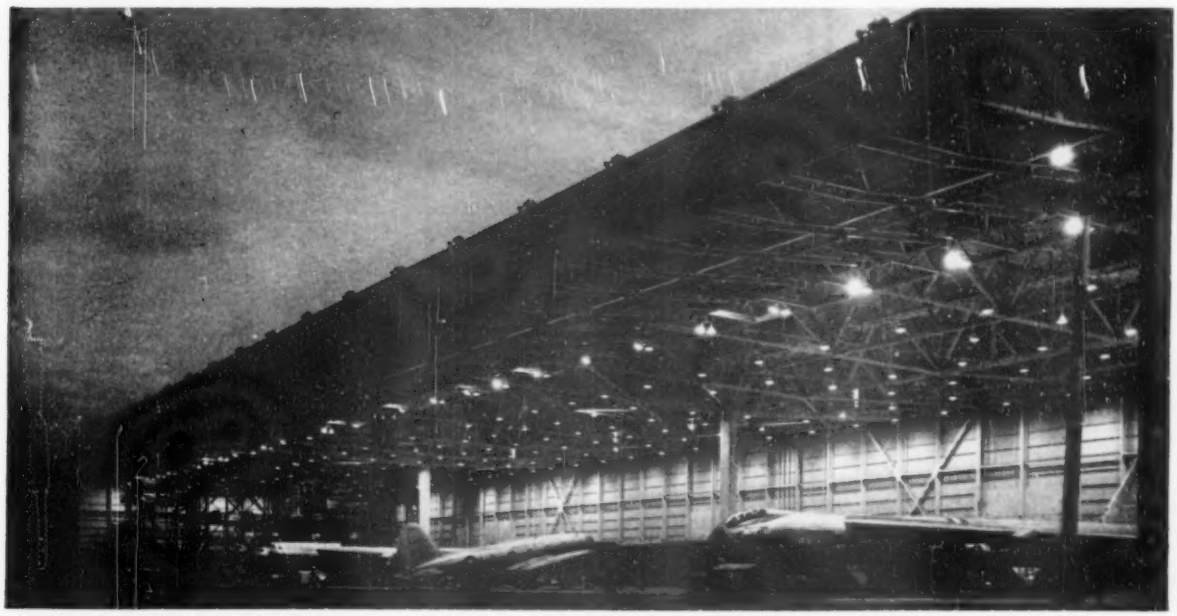
In addition to its giant, eight-jet B-52 Stratofortresses and the new four-jet 707 Stratoliner-Stratotanker transport, Boeing will be testing turboprop versions of the C-97 Stratofreighter and B-47 Stratojet. Experimental Flight Test will be operating more than 20 aircraft of different types.

This flight test program will be based in a vast building whose expansive interior can house five of the giant B-52s.

▶ **Test Pilot in Charge**—At the head of the organization will be test pilot A.M. (Tex) Johnston, waging an uphill fight against one company official's prediction that "Tex is going to spend more time flying a desk now."

Johnston, who favors cowboy boots and a string tie, looks more comfortable in a B-52 cockpit than he does behind a desk. But appearances can deceive.

A few weeks after Johnston took over his new post as chief of flight test last September, he reorganized the entire division, shifting to a project-type organization and dividing the flight test



LARGEST UNOBSTRUCTED DOORWAY in country is claim made for 780-ft. portal of new Boeing flight test hangar at Seattle.

REDUCE Maintenance Costs

with a

constant-speed AIRLINER MET-L-MATIC propeller by McCAULEY

The MET-L-MATIC propeller is unique in its class particularly because of its design details, which greatly *reduce maintenance costs.* Only the MET-L-MATIC propeller features a separator which prevents the balls of the main blade bearing from rubbing against one another. Bearing failures due to chafing and galling are eliminated and bearing friction is greatly reduced. As a result, the pitch change is *smooth and surge*-free. And the savings effected in bearing maintenance far exceed the slight initial cost of this separator in the MET-L-MATIC.

Check these features

- Sealed-in, factory-lubricated, pitch-changing mechanism.
- No pitch-changing parts exposed to weather.
- Hydraulically operated. Holds RPM accurately without wavering or surging.
- Forged Aluminum Alloy hub and blades for high strength—low weight.

• You fly with CONFIDENCE behind a Met-L-Matic propeller

(Available for 0-470 series engines, feathering and non-feathering models.)

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"World's largest maker of metal propellers for personal and business aircraft . . . more than 40,000 Met-L-Props, and now the new Met-L-Matic."

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section into five major groups: Production Flight Test, Experimental Flight Test Pilots, Operations, Instrumentation, and Supporting Services.

The duties of Production Flight Test and Experimental Flight Test Pilots are conventional. Operations maintains test aircraft, determines data requirements, handles data transcription and prepares reports. Instrumentation does research and development in its field and is responsible for installation of these devices in experimental aircraft.

Supporting Services supplies clerical and stenographic help, handles radio facilities and is responsible for such things as crew training and equipment and the Link trainer.

▶ **Further Expansion**—Boeing's experimental flight test section will more than double in size in the next year and a half, to almost 600 employes.

"These people will be handling the biggest load any flight test organization has ever been called on to handle," says Johnston. "We had to seek out different methods of operation, data recording and transcription to meet the workload or we would have had raw data coming out our ears."

The shift to a project-type organization was made last December when Johnston advised his staff: "An expansion program of this magnitude with the present organization would lead to severe overloading of supervisory personnel and result in serious inefficiency. To correct this condition it is necessary to segregate certain units, combine compatible services, clearly define responsibilities and establish unity in direction."

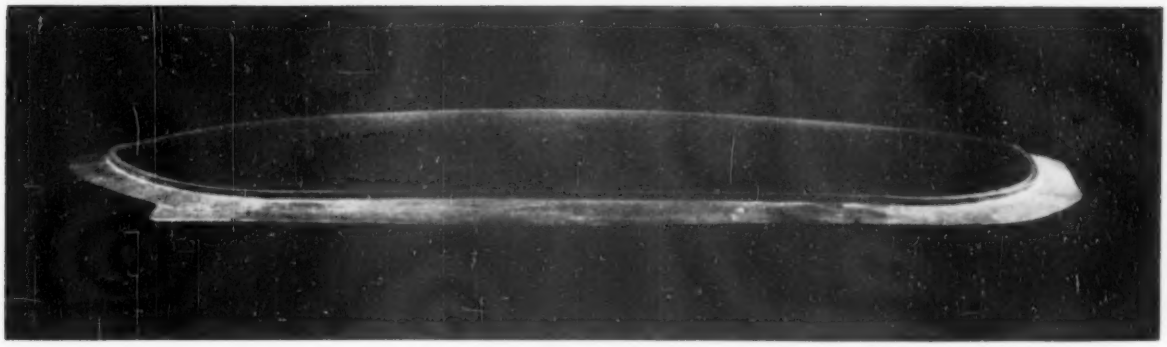
The project setup, he pointed out, assures efficiency by clearly defining responsibilities and establishes definite channels for coordination with project and staff units.

Each project now has a project pilot, test operations engineer and ground operations engineer. It is the responsibility of the project test operations engineer to plan test flights and handle data analysis after flight. The ground engineer keeps the test aircraft flying.

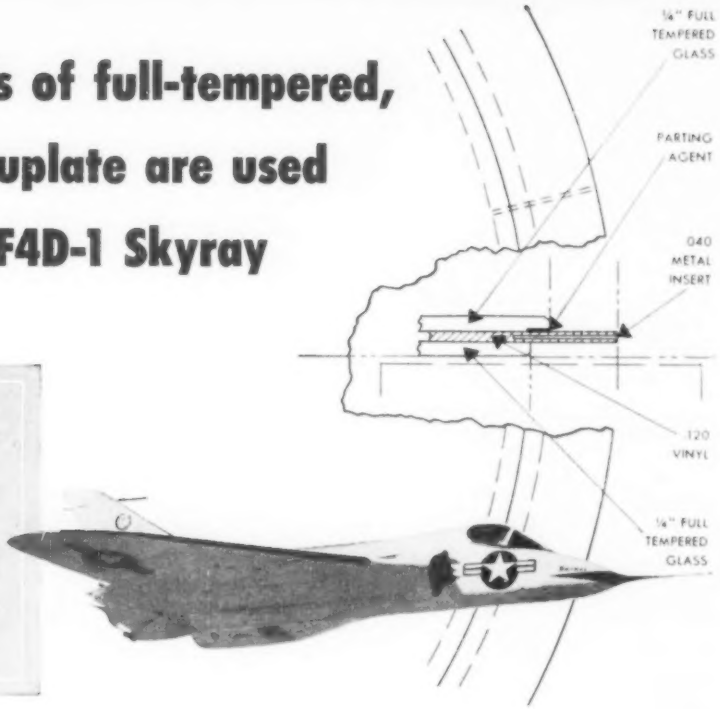
Boeing's engineering pilots usually handle two projects; but some require one project pilot full time.

"This is an age of specialization," says H. A. Rieke, Johnston's administrative assistant and right-hand man. "We are specialists in flight testing. It is a slightly different walk of life from that of the aerodynamicist or powerplant man. We know how to evaluate an airplane as an operational object. We are not experts in powerplant, aerodynamics and so on—we need support from people who are experts in those fields—but we know how to test those parts, know what weaknesses to look for."

▶ **Giant Hangar**—Headquarters for the



How side panels of full-tempered, bent Flexseal Duplate are used in the Douglas F4D-1 Skyray



A report from

THE PITTSBURGH AIRCRAFT GLAZING FILE

A tribute to American technology, the Douglas F4D-1 Skyray has brought the official speed record back to the United States from Great Britain.

The side panels of the aircraft's *all glass canopy* are large—have a compound bend, and—they are made to order by Pittsburgh Plate Glass Company.

The new Navy jet interceptor's side panels are metal insert Flexseal Duplate made by two pieces of ¼" thick full-tempered polished plate glass and a .120" vinyl filler. The over-all thickness of each panel is $\frac{5}{8}'' \pm \frac{1}{32}''$ maximum.

Each side panel has an over-all size of 26" x 38" with a radii of bends varying between 24" and 140"—depth of bend is $2\frac{1}{8}''$ maximum.

Pittsburgh Plate Glass Company makes a wide range of special purpose glasses for aircraft glazing. And a Pittsburgh Technical Representative will welcome the opportunity to work with you on your next design problem.

For more detailed information, write Pittsburgh Plate Glass Company, Room 4271, 632 Fort Duquesne Boulevard, Pittsburgh 22, Pa.

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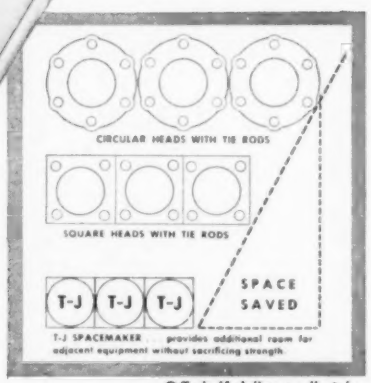
CIRCULAR HEADS WITH TIE RODS
SQUARE HEADS WITH TIE RODS
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SPACE SAVED
T-J SPACEMAKER . . . provides additional room for adjacent equipment without sacrificing strength.

Off shelf delivery all styles to 3" bore in increments of 1" to 12" stroke.

NEW T-J

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Streamlined design of the new T-J Spacemaker *eliminates tie rods . . . saves up to 40% in mounting space!* It's performance-proved . . . *super rugged* with extra high safety factor . . . solid steel heads . . . heavy wall, precision honed, *hard chrome plated,* seamless steel body . . . leakproof cylinder head to body construction . . . heavy duty, hi-tensile, *hard chrome plated* piston rod.

Available with the new T-J Super Cushion Flexible Seals which insure positive cushion with automatic valve action for fast return stroke. Many standard sizes and styles . . . for pushing, pulling, lifting, clamping or control jobs. T-J dependability. Write for bulletin 454. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON

RIVITORS . AIR AND HYDRAULIC CYLINDERS . CUTTERS . CLINCHORS

pilots, engineering staff, planes and laboratories will be a building where Stratofortresses can roll in and out through the largest unobstructed doorway in the U.S., 780 ft. long and 65 ft. high. Its 13 vertical-lift doors open from the flight apron into the air.

To support the weight of the doors when they swing up and out, the entire roof is cantilevered like a bridge across a river. Roof support comes from two columns within the structure, each capable of bearing some 5 million lb. weight. Roof trusses are tied down to anchor points in the rear of the building by steel tension columns.

But it is not only size which makes the new flight test hangar impressive. Its facilities are carefully planned for maximum efficiency in flight testing.

The need for this is apparent from Ricke's remark: "A single 3-hr. flight of a B-52 may have 1.5 million data points." To record, transcribe and analyze these is a major operation.

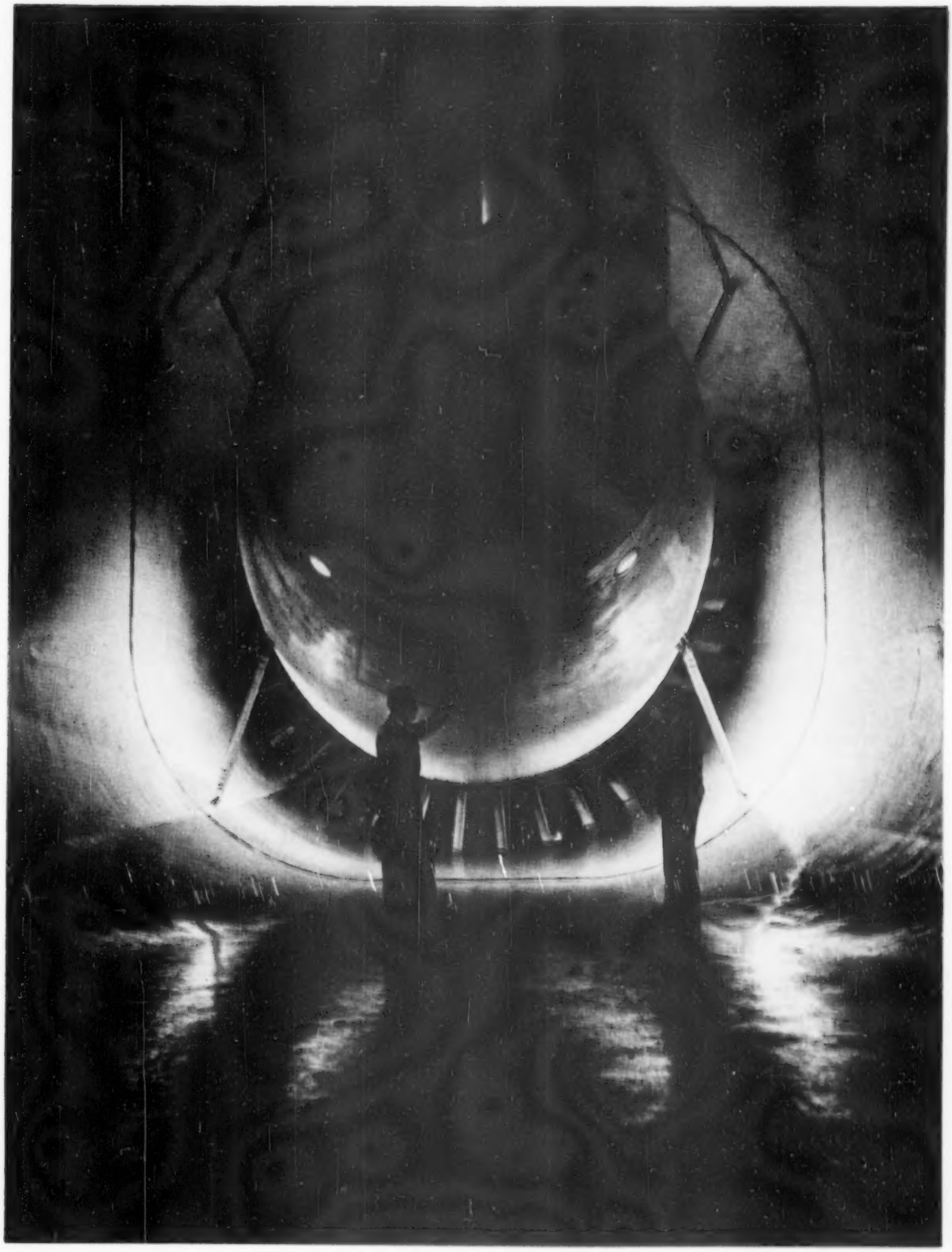
There is very little waste motion in a B-52 test flight. On each flight, 85% of the time the aircraft is in the air is utilized for actual flight testing. Even during the flight, information is being telemetered to Boeing technicians on the ground.

► **Communications Vital**—As space for crew members is reduced on high-speed combat aircraft such as the B-52, telemetering and radio communication take on an increased importance in flight testing. And as speeds increase, more powerful radio transmitters and receivers are needed to free the aircraft from the frequent turns which otherwise would be necessary to stay within radio range of ground engineers.

Close to $200,000 has been spent on the radio facility which will maintain this communication. Perched high on the roof of the new hangar is the control tower for Boeing flight test. Through its tinted Thermopane windows the tower operators can view the entire flight apron and maintain contact with test aircraft in the air. There is also a magnificent wind-whipped view of the entire Seattle area.

It's a rugged climb up a narrow stairway to reach this "island in the sky"—some seven stories above the ground. Complete living facilities are provided for the men on duty including a hotplate for preparing meals. A U-shaped control console is fitted into the front of the glass enclosure. Two low racks in the center hold receivers and a jack panel for connection to the console and to radio rooms in the ground floor of the building. There also is a direct connection to Tex Johnston's office so the chief of flight test can follow aircraft in the air without leaving his desk.

An "antenna farm" is sprouting on the flat roof of the hangar; there will



AMERICAN LATEX' NEW STAFOAM

From a liquid — poured in place: Strength to stir-up a roaring tornado (see next page)

Stafoam-Strengthened Blades Lash a Roaring Tornado Through Boeing Wind Tunnel

The world's largest privately owned wind tunnel uses Stafoam to give its fan blades the strength to kick up a transonic gale. The tunnel is a part of the Boeing Airplane Company's Edmund T. Allen Memorial Aeronautical Laboratories in Seattle. The strengthening material of the fan blades is Stafoam, the name applied to all foamed-in-place plastics manufactured by American Latex Products Corporation.

These Stafoam-strengthened blades will help engineers and scientists gather data in the trans-, and super-sonic flight range. They must be strong enough to withstand the stress and strain exerted on them by motors producing up to 54,000 horsepower; they must be light enough to serve as fan blades; and they must be able to resist the heat generated in the operation of a transonic wind tunnel. Besides having the necessary thermal characteristics and the most favorable weight/strength ratio, these Stafoam-strengthened blades save countless hours of manufacturing time. Stafoam is simply poured into the hollow fiberglass blades and in minutes it chemically foams into place, completely filling the cavity and bonding the blade into one, super-strong, lightweight unit.

Efficient, Fast, Simple

Blades for Boeing's giant wind tunnel were made by Boeing Airplane Company in Seattle, Goodyear Aircraft Corporation in Phoenix, and Raymond De-Icer & Engineering Company in Los Angeles. Here we see the simple process of pouring Stafoam at Raymond and Boeing. Filling cavities with Rigid Alkyd STAFOAM does away with the necessity for cutting and shaping a core and then painstakingly fitting other structural members around the core material. The parts and labor needed for such fabrication are also eliminated, together with the blueprints and engineering involved. Quickly trained workmen can pour liquid into the cavity which is to be strengthened. STAFOAM sets into a strong, lightweight core that bonds the two into one integral part.

Putting hollow fiberglass blade into foaming jig.

Mixing the Stafoam.

Pouring the Stafoam.

AS PROCESSED AT RAYMOND DE-ICER & ENGINEERING COMPANY

BOEING AIRPLANE COMPANY

Pouring a fairing core for one of the fan blades.

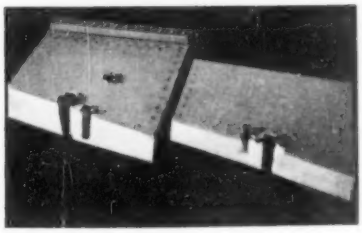
BOEING AIRPLANE COMPANY

Removing the fairing core mold.

BOEING AIRPLANE COMPANY

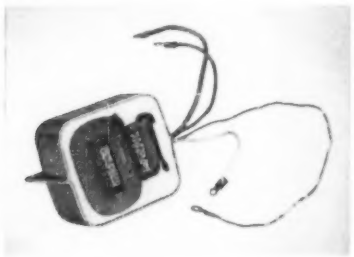
Final sizing of a fan blade fairing core.

Shatter Resistant



Cross section through STAFOAM-filled aileron showing firmness and lack of crumbling near holes made by .50 caliber machine gun bullet.

Electrical Adaptability



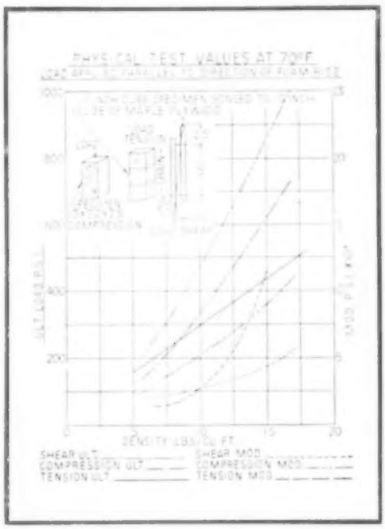
Stafoam is highly adaptable for insulating, cushioning, and potting transformers and other electronic devices, as shown above. Stafoam parts also can be pre-cast and bonded in place.

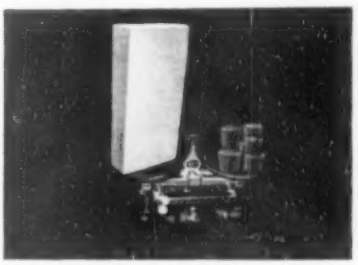
Stafoam's Astounding Variety of Properties and Uses Foretell Countless Potential Applications

Stafoam's applications are so varied, and the results obtained in extreme conditions are so gratifying, that it will revolutionize many manufacturing methods. Cell size and uniformity of cell distribution can be closely controlled — varying from a nearly amorphous structure to cells of $\frac{1}{4}$ inch diameter. Formulations controlling weight, strength, density, and texture can be prepared at will. This almost limitless range of controllable properties means that Stafoam can be formulated to meet specific engineering problems. Stafoam may be the unsuspected answer to *your* unsolved problem.

Physical Test Values at 70° F

Load applied parallel to direction of foam rise.





Extreme light weight of this Stafoam formulation is shown in relation to weight of cork.

The small sample and the large sample weigh the same, further emphasizing wide range of densities possible in Stafoam formulations.

NOTE

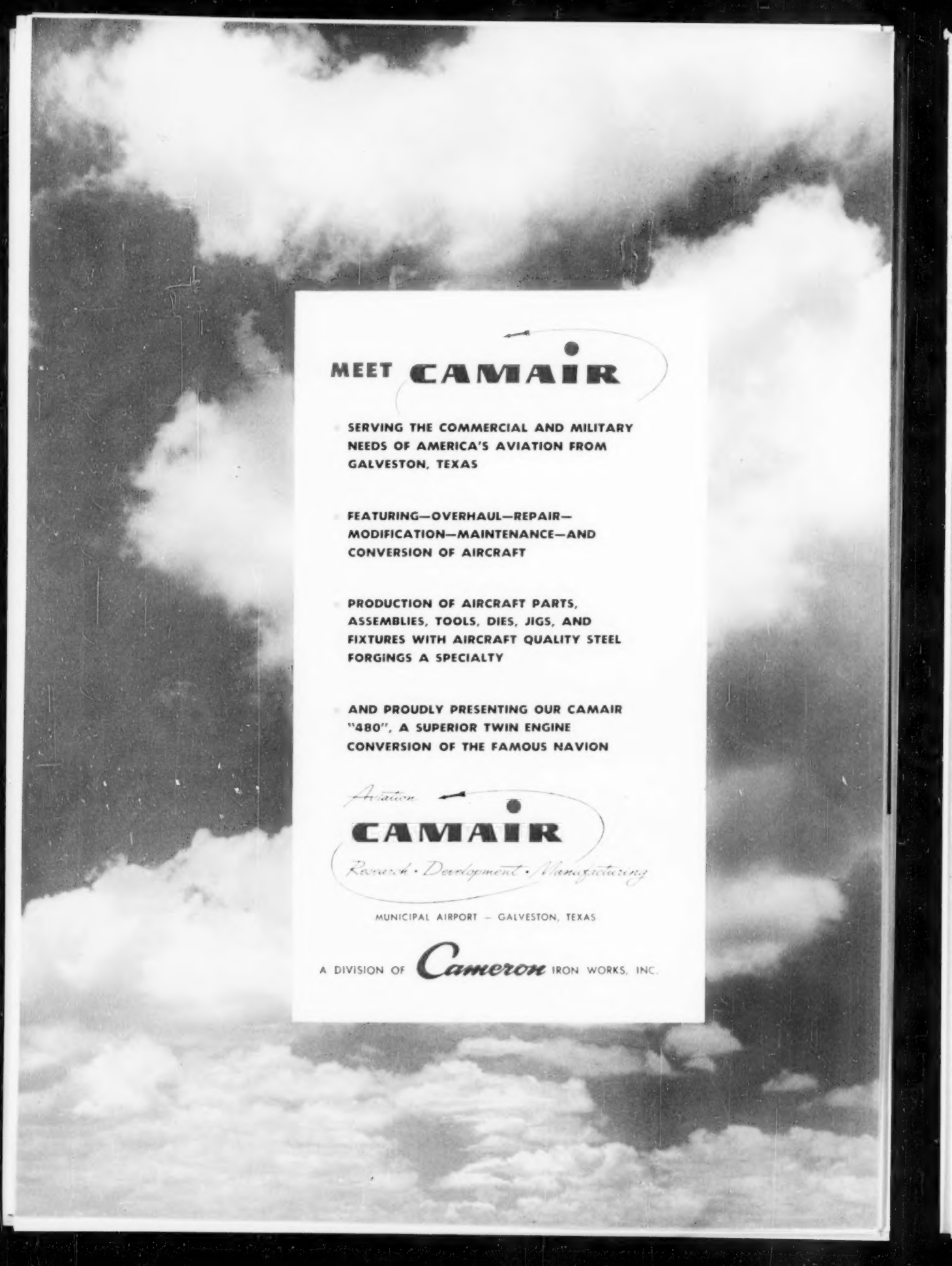
Because of space limitations in this ad, information is necessarily incomplete. STAFOAM is supplied in hundreds of variations in density, texture, color, strength, insulation and thermal characteristics. For more general information on this truly miracle foam plastic, write for our STAFOAM brochure.

STAFOAM, a registered trademark of American Latex Products Corp., is manufactured under *LOCKFOAM patents owned by Lockheed Aircraft Corp., Burbank, Calif.

**Registered Trademark of Lockheed Aircraft Corporation.*

American Latex Products CORPORATION

3341 West El Segundo Boulevard • Hawthorne, California



MEET CAMAIR

- SERVING THE COMMERCIAL AND MILITARY NEEDS OF AMERICA'S AVIATION FROM GALVESTON, TEXAS

- FEATURING—OVERHAUL—REPAIR—MODIFICATION—MAINTENANCE—AND CONVERSION OF AIRCRAFT

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- AND PROUDLY PRESENTING OUR CAMAIR "480", A SUPERIOR TWIN ENGINE CONVERSION OF THE FAMOUS NAVION

Aviation

CAMAIR

Research • Development • Manufacturing

MUNICIPAL AIRPORT — GALVESTON, TEXAS

A DIVISION OF *Cameron* IRON WORKS, INC.

be between 40 and 50 antennas up here when work is completed.

▶**Transmitter Installations**—Transmitters are installed in small rooms hung under the ceiling of the hangar. These are reached by narrow catwalks 75 ft. in the air. From up here—more than five stories in the air—people on the floor of the hangar dwindle to ant-size. A B-29 becomes insignificant from this height. Only the B-52s refuse to shrink. They still look huge.

It is up here in the rafters that you can best see the heavy steel work which has gone into the building, the massive beams and giant bolts. The special transmitter rooms are located under the roof to cut down the length of lead wires to the roof top antennas. Location of the transmitters on the ground would cut power to the antennas as much as 50% in some cases, according to Russell Winslow, group engineer in charge of radio facilities.

To reduce the fire hazard, a special carbon-dioxide fire extinguishing system protects each of the transmitter rooms. As in the tower itself, use of wood is held to a minimum to reduce the danger of fire. Despite the weight, the floors of the transmitter rooms are of concrete. Wires thick as a man's thumb run down to earth for grounding.

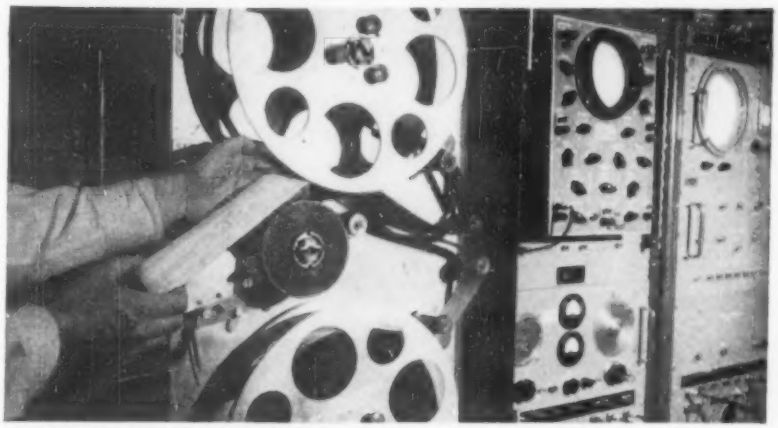
▶**Data Reception**—Transmitters and receivers are linked to three windowless soundproof radio and telemetering rooms in the long one-story shop and office building at the rear of the hangar. From here, engineers can keep in touch with test aircraft during flight. They can watch the inked lines on charts pouring from the telemetering machines, lines transmitting information from remote points on the aircraft to increase both safety and efficiency of men flying an aircraft many miles away.

Is flutter getting too severe at some point on the aircraft? They can warn the pilot by radio before he himself is aware of it. If information can be recorded electrically, it can be transmitted to the telemetering machine from measuring devices on the aircraft.

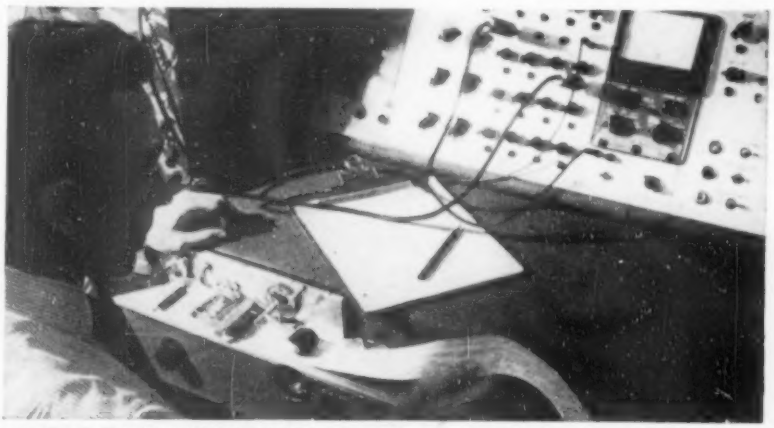
▶**Data Processing**—Down the hall in a soundproof room is the section which faces one of the toughest jobs of all, the Data Processing Group. The object of flight testing, Rieke points out, is to obtain data—data which is of no value unless it is in usable form. The information from hundreds of thousands of data points must be correlated and analyzed. Techniques of data reduction therefore are receiving increased emphasis in the Boeing flight test division.

Electronic methods are used to reduce data to a card system which can be fed to the company's million-dollar calculator. Here some of the complex equipment developed by Telecomputing Corp. of Burbank, Calif., is used by Boeing to provide its human talent

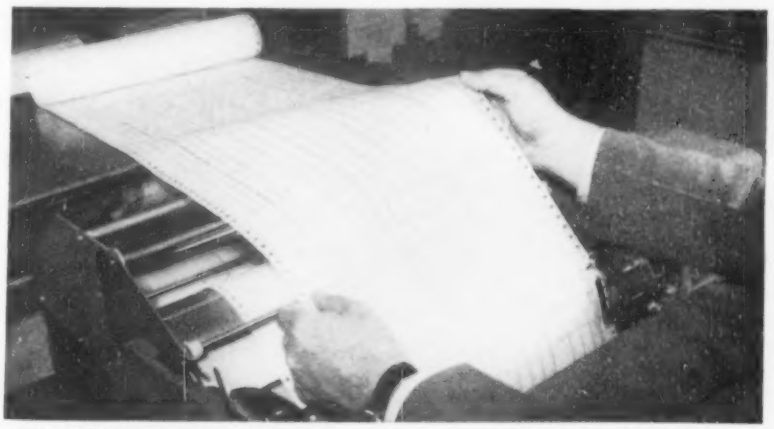
Bomarc Missile Flight Analyzer



INTERMEDIATE TRANSCRIBER for data telemetered down from flights of the Bomarc missile has been developed by Boeing Airplane Co. to solve problem of converting original magnetic tape recordings into more useful punch cards. Card punching machine cannot keep up with magnetic tape played back at original recording speed and tape cannot be slowed down without loss of signal.

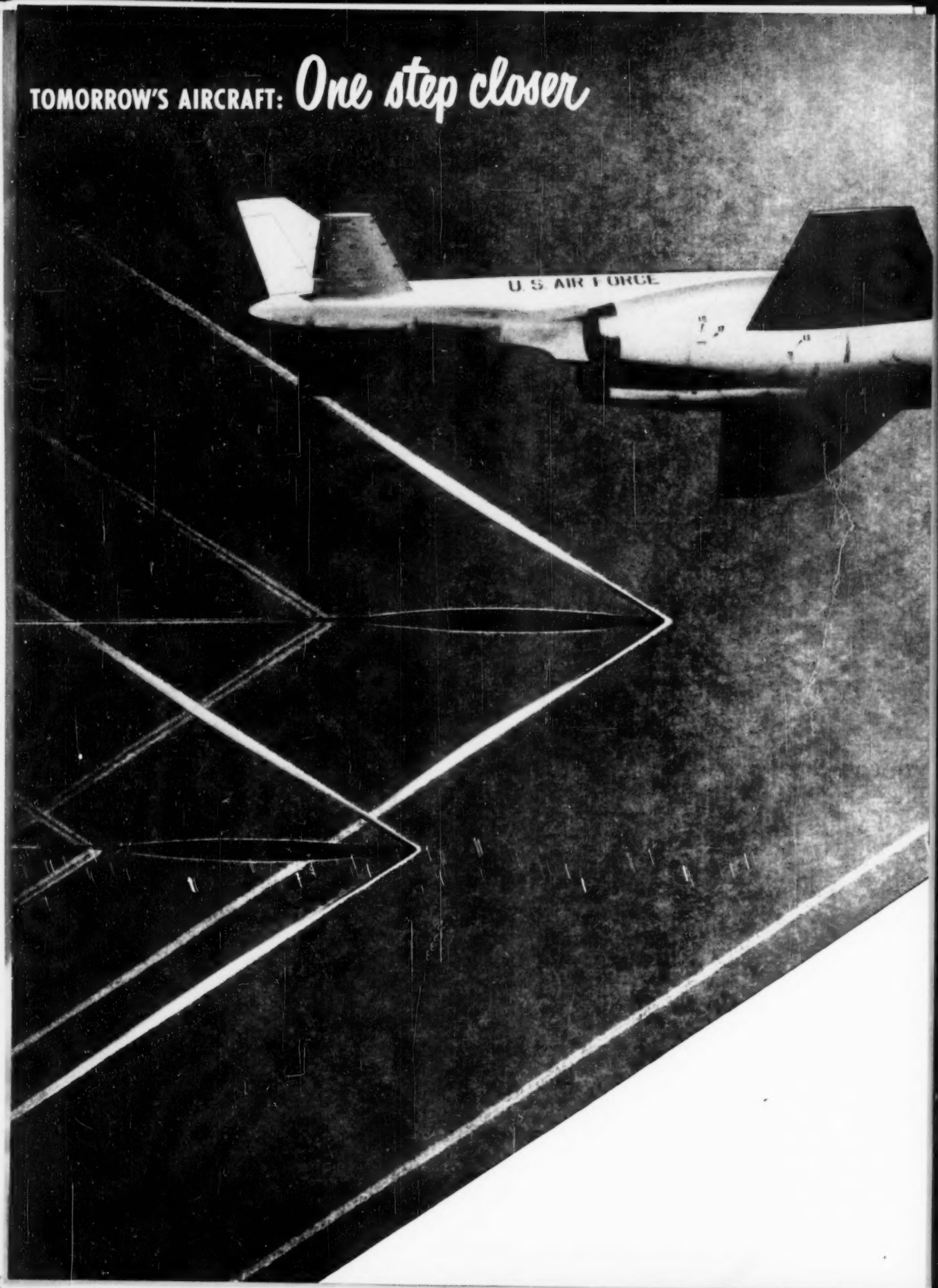


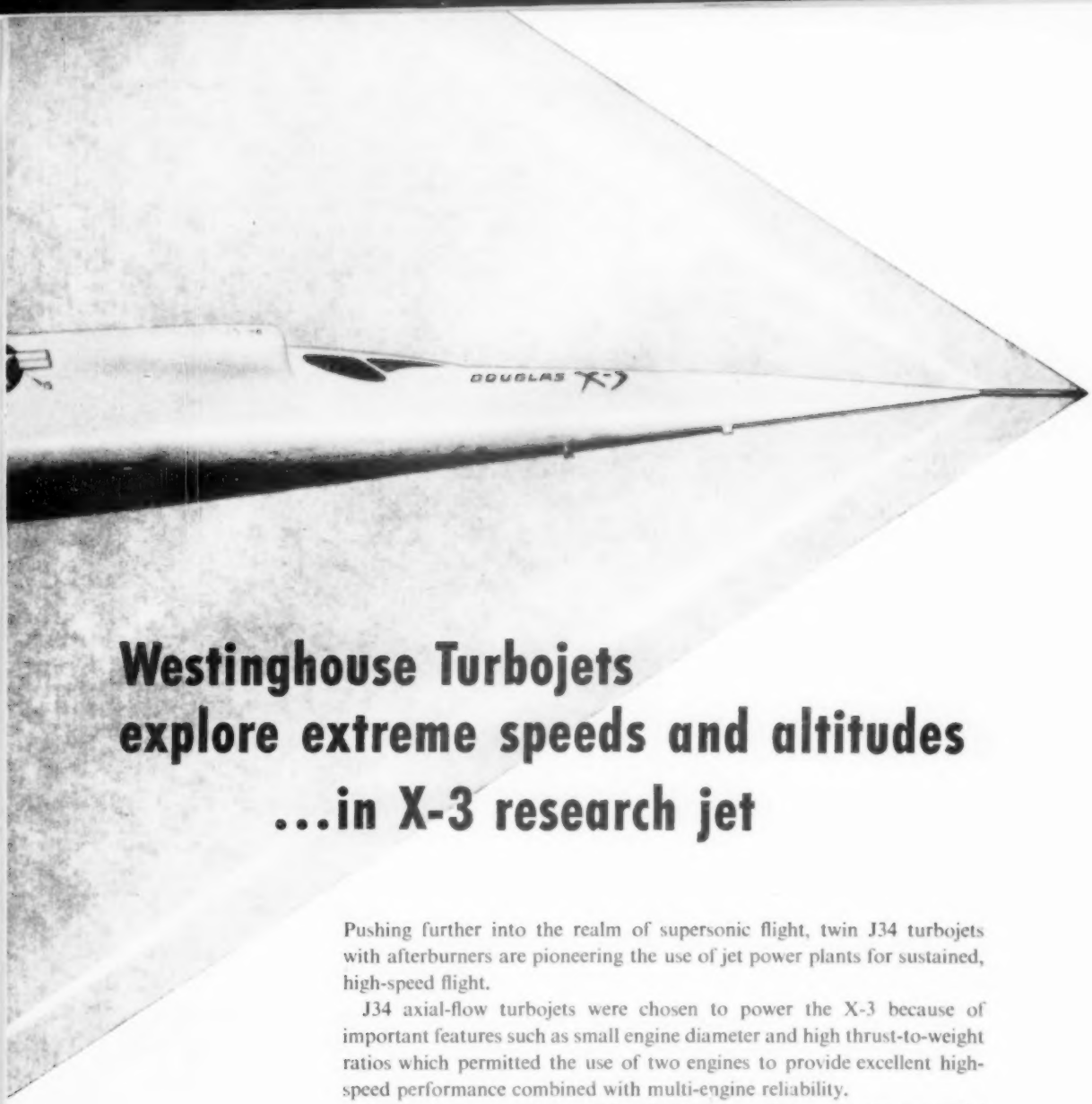
VISIBLE TAPE RECORDING, using electric needles which carbonize surface of special recording paper, is made from magnetic tape and then run through a data converter (above) at a sufficiently slow speed to feed punch card perforator.



600 MAN-HOURS LATER, five days after the missile flight, 7,200 ft. of magnetic tape has been converted into punch cards which then feed a plotting machine to produce a graphical picture of the missile's flight. As many as 1,600 graphs, each 5 ft. long, together with movies, still photos, and oscillograms must then be analyzed.

TOMORROW'S AIRCRAFT: *One step closer*





Westinghouse Turbojets explore extreme speeds and altitudes ...in X-3 research jet

Pushing further into the realm of supersonic flight, twin J34 turbojets with afterburners are pioneering the use of jet power plants for sustained, high-speed flight.

J34 axial-flow turbojets were chosen to power the X-3 because of important features such as small engine diameter and high thrust-to-weight ratios which permitted the use of two engines to provide excellent high-speed performance combined with multi-engine reliability.

Westinghouse experience and technology are directed at the successful conquest of aviation frontiers. Continuing advancements merit your attention no matter what the aerodynamic design or weapons systems application might be. Let Westinghouse help you bring tomorrow's aircraft . . . One Step Closer. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa. J-91018

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with an electronic assist. The processing equipment consists of a reader, calibrator, Cardex, modified typewriter and teleplotter.

It can do in a day the job it would take six girls a week to do, processing better than 2,000 data points in an eight-hour day.

Down one side of the same room is a line of small enclosed booths—much like voting booths—which are used for reading film from the photo-recorders.

▶**B-52 Testers**—In an adjoining room are the engineers who depend heavily upon this data for their planning, the B-52 project group. At one end of the room hangs the board outlining the flight test schedule for the YB-52.

Here, in effect, you can see both the beginning and the end of the data gathering and reduction processes. When the big YB-52 takes to the air for the flight tests scheduled on the board, it will check data already analyzed while at the same time providing new data for project engineers. A seemingly endless chain but one which pays high dividends.

"We already know more about the B-52 in less than two years of flight testing than we have ever known about any other airplane in that length of time," Tex Johnston remarks.

In flight testing an aircraft the size of the B-52, each hour of flight is expensive. Each must count to the maximum. What does a B-52 crew do on a test flight? The board's colorful markings show tests scheduled to check spoilers, thermal anti-icing, MA-2 autopilot, K-3A bombing system, stability characteristics, compass calibration, bomb racks, bomb drops, fuel vents, vortex generators, and wheel well doors.

▶**Instrument Planning**—What might be called the nerve center of the flight test section is the instrumentation lab. Instrumentation for test aircraft is planned well in advance. The first B-52A which the flight test section receives, for example, will have all the "plumbing" and wire runs installed for its instrumentation. It will take approximately three weeks to connect the instruments themselves and then the Stratofortress can be airborne on its test program.

The new instrument lab is designed to serve both the calibration group and the equipment maintenance group, as well as providing an area for developmental work.

▶**Lab Highlights**—George Harned, engineer in charge of the lab services group, points out some of the features of the carefully planned lab:

• **Basic power supply** to bench locations of 28-v. d.c. with 100-amp. capacity; 400-cycle at 110-v. and 26-v. three-phase and single-phase.

• **Compressed air** and vacuum line to all bench locations, with outlets at 4-ft. intervals on each bench in the six bays.

• **Transfer cable setup** by which up to 10 pairs of lines can be patched to any bench location.

• **Special power panels** for the maintenance section which have voltage and current measuring instruments right on the bench panels.

• **Shielded room** for interference-free testing.

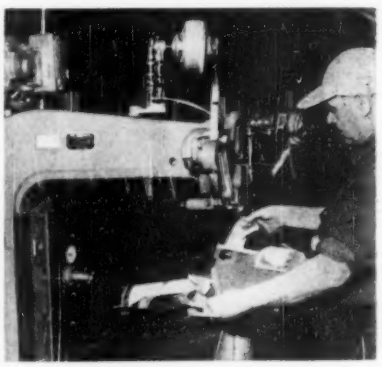
• **Environmental test chamber** built by the Bowser Technical Refrigeration Division of Bowser, Inc., which will have an ambient test range of −100 to 180F. Its 16-cu. ft. capacity can test altitudes to 100,000 ft.

• **Load test machine** with a 20,000-lb. capacity. This was built by the Tinius-Olsen Testing Machine Co.

The new building also includes an up-to-date photo lab, which will handle oscillograph processing as well as regular processing of flight test film and photos. This group also is faced with solving such problems as camera fogging and frosting in changes from heat to cold at various altitudes.

▶**Static Tests**—B-52 static testing already has begun in the massive static test framework at one end of the hangar. Some 114 tons of 12-in. steel channel assemblies and nearly 30 mi. of reinforcing steel are embedded in a concrete slab more than two-feet thick. Flight test does not operate the static test structure but lends support on data computing and other services.

Completion of this modern facility has not stilled the familiar complaint of flight test divisions everywhere. "You know," said Rieke two weeks before the division moved into the new hangar, "we're already cramped for space."

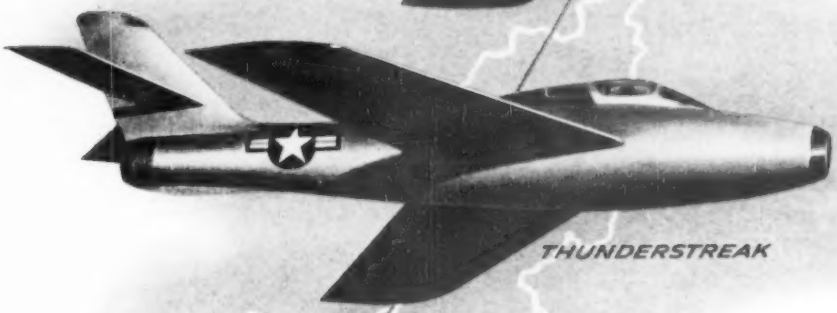


Stitches Metal

Piper Aircraft Co. is using metal stitching machines to join felt strips to aluminum baffle plates and oil filter vents, rubber bead to aluminum landing gear skirts and leather pockets to steering post collars. This has increased production capability of each worker 400% and eased assembly operations, says Acme Steel Co., Chicago, Ill., maker of the machine.

SUPERIORITY...

THUNDERFLASH



THUNDERSTREAK

THUNDERJET

THUNDERBOLT

For more than a decade Republic has designed and built a succession of Thunder-craft fighters and fighter bombers for the U.S.A.F. which have proven without peer. ➤➤ The mighty THUNDERBOLT of World War II established a proud record in combat as the sturdiest, deadliest "work horse" of its time . . . the THUNDERJET which earned its fame as a fighter bomber during the Korean War is maintaining its own fine position of leadership with our Air Force and our allies in NATO. ➤➤ The new THUNDERSTREAK, now in service, and the THUNDERFLASH, its photo-reconnaissance counterpart, with an entirely new range of speeds and effectiveness emphasize that each product of Republic's know-how maintains superiority of performance in its field.

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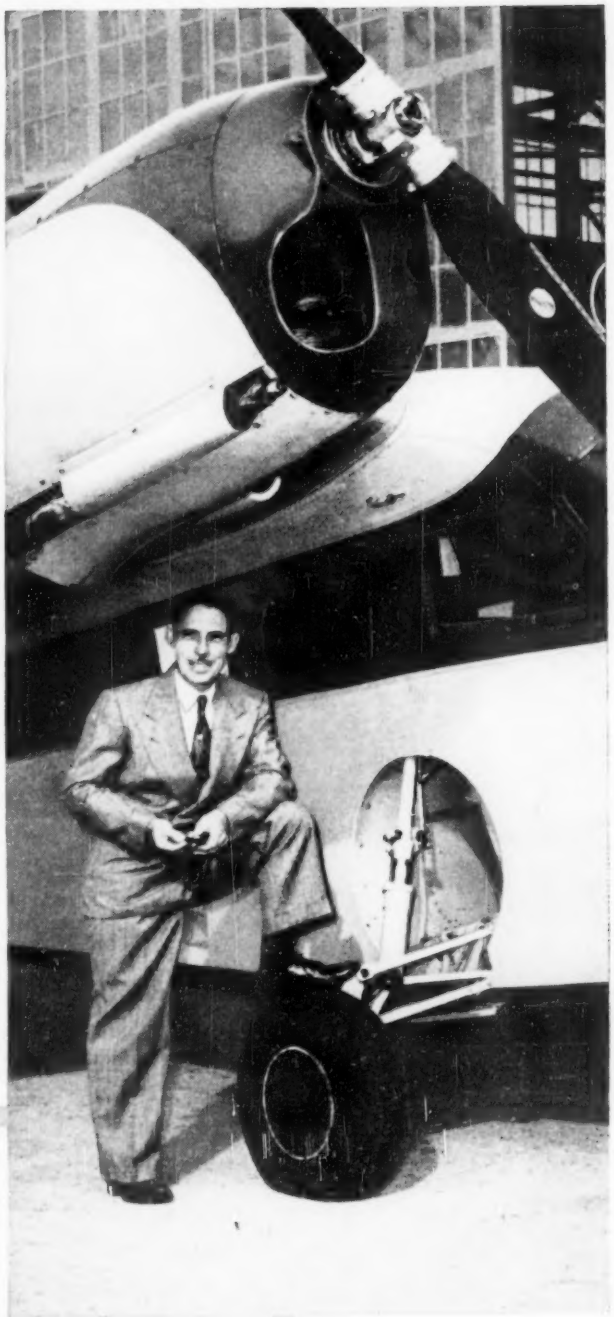
FARMINGDALE, LONG ISLAND N. Y.

Builders of the Incomparable **THUNDER-CRAFT**

Executive Pilot Sims standing by the Grumman Widgeon he flies for the Helis Estate.



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For radial engines, or where a detergent oil is not desired. Approved by Pratt and Whitney and other radial engine manufacturers for all types of service. Retards sludge and carbon formation and retains its body at high operating temperatures.

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For horizontally opposed and Ranger in-line engines. Minimizes ring and valve sticking, oil consumption, oil-screen clogging and plug fouling. Users of this great detergent oil have actually increased periods between engine overhauls by as much as 100%.

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It's "refinery-clean," because Gulf Aviation Gasoline dispensing equipment is equipped with advanced Micronic Filters.

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Airline Long-Term Debt

Company	Interest Rate	Maturity	Outstanding Dec. 31, 1953*	Current Market Quotation
American	3 %	June 1, 1966	$30,000,000	96½
Braniff	4½	May 1, 1963	2,000,000	83
Capital	3½	Sept. 1, 1960	1,031,000 [1]	96
	4	Sept. 1, 1960	700,000 [1]	100¼
TWA	3¼	Dec. 1, 1955 and June 1, 1956	18,049,000 [2]	100 [3]
United	3½	Feb. 1, 1967	20,096,000 [2]	100 [3]

NOTES: [1] *As of Apr. 30, 1954.*
[2] *As of May 30, 1954.*
[3] *Valuation indicated by insurance commissioners.*
* *Excludes bank loans.*

Trunks' Senior Debt Credit Is High

Standing of airlines' long-term obligations is on par with those of prime industrial and utility securities.

Almost unnoticed amidst the financial cross-currents of the air transport industry is the high credit standing now being accorded long-term debt of the trunk carriers. With but one exception, this debt commands a price on a par with that of prime corporate industrial and public utility securities.

That this present high state of trunk airline long-term credit was not always so becomes evident from a review of each of these airline credits. Excluding bank credits, which are primarily intended for relatively short-term periods and have different characteristics, five trunk airlines have long-term obligations outstanding with the public or institutional investors.

► **AA's Experience**—American Airlines has the largest actual debt outstanding and carries the lowest interest rate of the group. Its financing experience also reveals excellent timing and investment banking sponsorship of high character in a sliding market.

In the summer of 1946, an investment banking group headed by Kidder, Peabody & Co. marketed an issue of $40 million in 3% debentures and $40 million in 3¾% preferred stock. At about that time the market for this type of securities, particularly of the airlines, began to deteriorate. Nevertheless, both issues of the American offerings were sold, although at some price concessions which meant losses to the underwriters. The airline, however, received the full amount of the underwriting commitment. No airline debt or equity securities have been sold since on such favorable terms.

► **Profitable Recapture**—Reflecting the deteriorating fortunes of the airline industry in general and American in particular, the company's debentures sold as low as 67 a few years after their offering. A gradual price recovery was made as earnings improved.

In an astute move by the management, some $10 million principal amount of these debentures was acquired in the open market during 1949 and 1950 at a price believed to average around 90. In addition to acquiring these bonds at a discount, American anticipated all sinking fund requirements for all years up to June 1, 1958. In other words, the company has until mid-1958 to meet the annual requirement of retiring $800,000 in bonds. (For subsequent years, these requirements step up to $1,350,000 annually.)

Most of these outstanding debentures are believed to repose in the portfolios of large institutional investors, making for a small floating supply in the hands of the general public. This means that under prevailing circumstances any future debenture retirements may be called, necessitating slight premiums as compared to present quotations of around 96½.

► **Mid-Continent-Braniff**—The only airline long-term debt selling at a considerable discount is that of the Mid-Continent 4½% convertible debentures assumed by Braniff.

This issue was originally sold by Mid-Continent in May 1951 in the amount of $2 million. A conversion feature was added to "sweeten" its acceptance among investors. When Braniff acquired Mid-Continent it also assumed this obligation. Present quotations of around 83 for these debentures reflect the current weakened position of Braniff.

► **Capital Debentures**—Capital Airlines' long-term debt stems from the inept financing sponsored by its then investment bankers in September 1945. At that time, a total of $10 million in 3¼% convertible debentures were sold. Having most attributes of a convertible preferred (which observers maintained should have been sold instead) these debentures nevertheless had various restrictions which were to serve in later years to unduly hamstring management without affording the holder any real protection.

A recapitalization was found necessary and accomplished in November 1949. As a result, the debenture holders were offered an exchange of new Series A and B 4% debentures in equal amounts. Only the Series B were convertible. Prior to that time, previous retirements had reduced the old 3¼% issue to $7,385,000. Of this total, $5,991,000 elected the exchange offer. This created $2,995,500 principal amount of each of the Series A and B, plus $1,394,000 of the original 4½% issue. The Series B issue was called for redemption on Mar. 12, 1951.

Coming down to Apr. 30, 1954, it is found that of this original $10-million long-term debt only $1,731,000 was outstanding. This consisted of $700,000 in the newer Series B debenture and $1,031,000 of the old 3¼s. A strong sinking fund requirement of $500,000 annually has been very effective in cutting down this debt. It is noteworthy that the operation of this sinking fund should completely extinguish this particular debt by 1958—well in advance of the stated maturity. It is interesting that the Capital Series B issue sold at a premium recently and the old 3¼s at 96. Back in 1946 and 1947, the original 3¼s had few takers when quotations were in the low 30s.

This accomplishment of complete restoration of credit is a reflection of the successful rehabilitation of a sick property by present management.

In fact, this reduction in long-term debt is even more significant in that it has been accomplished while equity values have been sharply augmented without substituting other forms of debt. For example, at Dec. 31, 1947, the company showed a net worth deficit of $784,457. At Dec. 31, 1953, it could report a hefty net worth position of $10,971,233. Total debt of all types aggregated $13,850,000 at the 1947 year-end. At the close of 1953, total debt amounted to but $4,385,000. The company now has the lowest debt-to-capital ratio of any major airline.

► **Trans-World's Rebound**—TWA, under the leadership of Ralph S. Damon,

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has achieved a remarkable recovery which is reflected in the company's restored credit position. The ill-conceived $40-million insurance company loan foisted upon the carrier in 1945-1946 (without adequate equity support) plagued the company in a series of financial stringencies, the effects of which are still noticeable. At one point, the insurance company was directed by the committee on Valuation of Securities, National Assn. of Commissioners, to carry this loan on its books at 50 cents on the dollar.

Today, because of the strenuous efforts of management in bringing TWA along, which finds manifestation in a strong buildup of the equity, this same valuation agency has priced this debt at par, or 100.

Only recently TWA made another $2-million sinking fund payment, reducing this insurance company loan down to $18,049,000 as of May 28, 1954. The bulk of this outstanding loan is scheduled to mature by June 1, 1956. In view of TWA's projected capital expenditures along with other maturities during the next few years, a refunding operation of its debt structure is clearly indicated. (As of Dec. 31, 1953, other debt amounted to more than $23.8 million.) However, this should present no insurmountable problem.

▶ **United's Debt**—United Air Lines' long-term debt is held by two insurance companies. A $12-million issue of 20-year 3½% debentures was sold as part of the company's 1947 financing. Despite the deficits of that year and 1948, servicing of this debt was never troublesome. A balanced capital structure, that had been maintained by United, stood the company in good stead as it and the rest of the industry subsequently restored its earning power.

As part of its 1952 financing, another $10 million in 3½% debentures, but with a 15-year maturity, was sold to the same insurance companies. A tribute to United's strong credit position is the unsecured nature of this debt and the favorable interest terms obtained in 1952 when other comparable corporate loans were made at higher interest rates.

That the trunklines studied above now command a favorable credit status with regard to their senior securities is a demonstration of the measure of acceptance and maturity achieved by a segment of the industry. Unfortunately this condition does not apply to their junior equity issues. Here, investment support has been discouraged by disappointing regulatory policies.

Once again this reveals the degree of selectivity so pronounced in the group, not only as to company, but as to type of security as well.—**Selig Altschul**

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The tones are received by a decoder in the aircraft. When the assigned tone code is received . . . it activates a visual or aural cockpit signal. After the pilot is alerted . . . communication is carried on in the normal fashion.

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ARINC reliable tubes . . . single unit weighs only four pounds. More than 1400 codes available. Easy to remove dust cover to change frequency and easy to service. Resonant Reed Relays from 312.6 cps to 977.2 cps. CAATC #1R3-22

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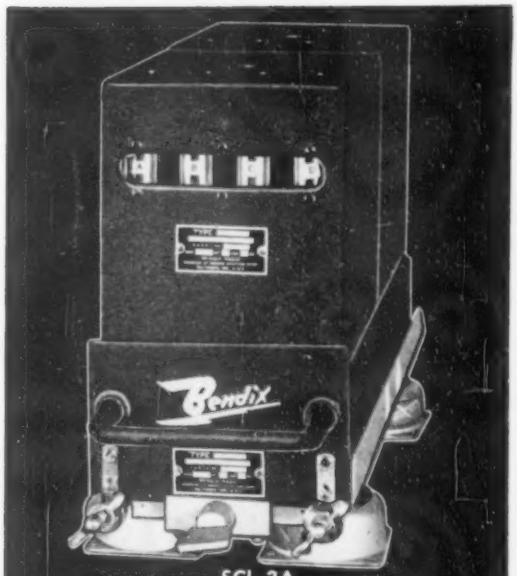
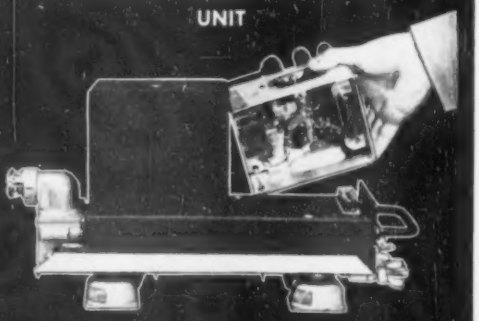
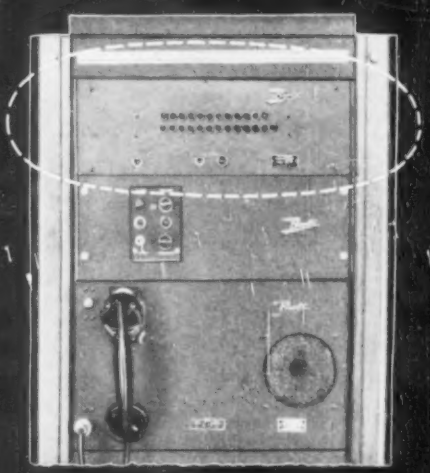


SCL-3A
AIRBORNE SELECTIVE CALLING UNIT

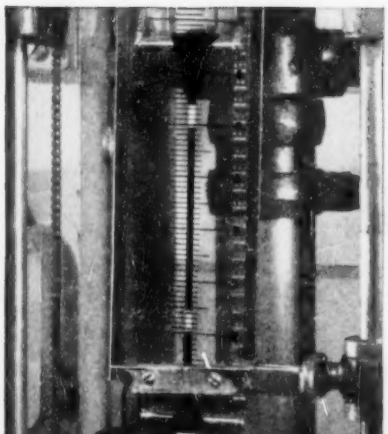




OSC-3A
SELECTIVE CALLING OSCILLATOR (GROUND UNIT)

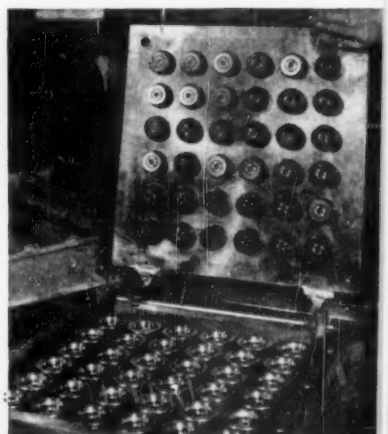
THE NAME Bendix AVIATION CORPORATION MILLIONS TRUST

No wonder



2. Elongation, tensile strength and maximum compression set ratings are determined with care. Laboratory and service tests make sure these rated characteristics are held.

3. Fluid and temperature tests check compound resistance to oils, fuels and chemicals at high and low temperatures . . . assuring the long life of Parker O-rings.



4. Precision molding of superior compounds provides close tolerance fits. Parker has molds for *every* standard O-ring size. Mail the coupon for data.

the other one leaked!

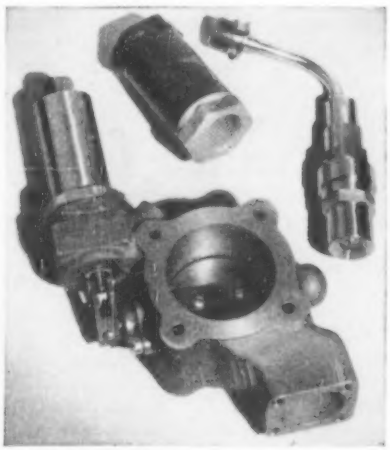
Comparison tests prove Parker-formulated rubber O-rings successfully withstand fluid, temperature, or pressure conditions

1. New nonflammable hydraulic fluids ruined one O-ring . . . didn't harm the other in this sealing test. Both were originally the same size. Yet, one is now swollen, chewed and chipped. The other wasn't damaged because it was molded of a Parker compound that resists nonflammable fluids.

Pressure and temperature can also cause problems. When you use Parker O-rings, you are sure to get exactly the *right* O-ring for your *specific* application. For instance, Parker's new compound 612-45 fully meets requirements of MIL-R-7362 covering synthetic-rubber seals for use in high-temperature lubricating oils.

Parker O-rings are approved for *all* military applications. We invite you to compare Parker O-rings with any other make. Here are some of the reasons why you'll find they seal better and last longer . . .

5. Compare actual samples. Ask your Parker representative to check your specifications. Prove how Parker O-rings seal better and last longer.



6. What other Parker products for aircraft applications interest you? We build jet-engine accessories (shown above) for engine *fuel, hot-air* and *hydraulic* systems.

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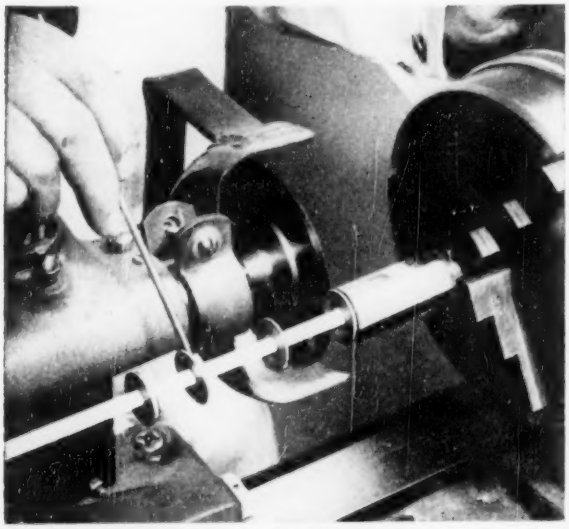
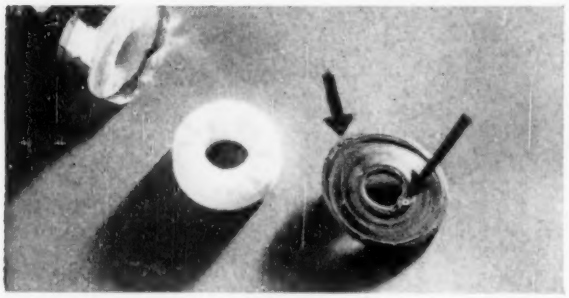
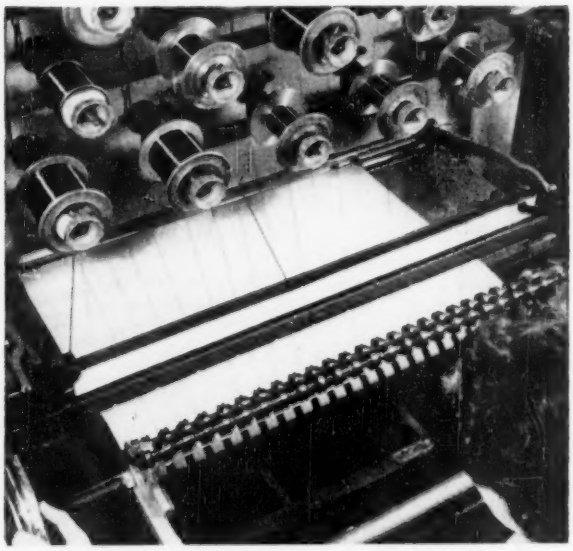


1. **FOIL-DIELECTRIC** tube is sliced into wafers.



2. **WAFER** with metal studs (arrow) for connections.

3. **STACKED** coils form transformer (exploded view here).



4. **OLD WAY** of winding coils was production bottleneck.

Slice Technique Cracks Coil Bottleneck

Tube of metal foil and dielectric is cut in desired thicknesses; new method opens way to mechanized production of transformers.

By Philip J. Klass

A radically new technique for making low-frequency transformer and choke coils, by winding a sheet of metal foil and dielectric into a tube resembling a long paper capacitor and then slicing it like bologna, may open the way to fully mechanized production of transformers and chokes.

The new "Auto-wafer" process, developed by Sylvania Electric Products, holds promise of removing a major obstacle to fully mechanized production of electronic equipment. It could also eliminate what was one of World War II's biggest bottlenecks: the manufacture of transformers.

Sylvania engineers estimate that the new technique can cut coil manufacturing time by a factor of eight and material costs by a factor of three. Sponsored by the Wright Air Development Center's Electronic Components Lab, first details on the Auto-wafer process were revealed during the recent San Francisco automation symposium in a paper by Sylvania engineers Albert Zack, Ted Wroblewski, and Wilson Hannahs.

▶ **Fully Automatic Production**—Sylvania engineers envision machinery for the completely automatic production of transformers, including winding and cutting wafers, etching and insulating them, finally stacking them onto cores. The company has proposed and hopes to get a USAF contract to develop such machines.

Based on studies to date, Sylvania reports that the new technique offers attractive savings solely on the basis of material costs, excluding anticipated labor savings.

For instance, the cost of raw material to produce a typical audio-frequency transformer coil by the Sylvania Auto-wafer process is only 6.7 cents versus 17.9 cents for conventional construction, company engineers report. Time required to make each coil is only 1.13 minutes for Auto-Wafer versus 8.5 minutes for conventional construction, they say.

▶ **Had Resisted Automation**—Despite recent successes in mechanizing large portions of electronic production, the manufacture of audio frequency transformer and choke coils has resisted automation. Even the Navy's "Project

Tinkertoy" automatic factory, which made its own printed resistors, capacitors, and modules from raw materials, had to use inductive components made on the outside by conventional hand processes.

Although machines have been used to wind coils (see photo, p. 68) skilled hands are needed in conventional manufacturing processes to pull out the start and finish leads of wire, frequently smaller in diameter than a human hair. Finishing operations, including wrapping, have also involved hand operations.

▶**Printed Circuits Rejected**—Printed circuit techniques which had previously been successfully applied to intermediate transformer coil construction were investigated first by Sylvania, but rejected for audio-frequency use. Minimum practical width of coil conductors formed by photo-etch or similar techniques was 0.01 inch, with another 0.01 inch of spacing between turns, Sylvania found.

When stacks of these printed circuit coils were used to make audio-frequency transformers, where many turns were needed, the resulting transformer was two to three times larger than its conventional counterparts. This was too steep a price to pay for mechanization.

Capacitor-Type Construction — If sheets of aluminum or copper foil and dielectric are wound into a tube, much as paper capacitors are formed, then sliced into thin wafers, the result is a coil which resembles printed circuit units but is far more compact.

For instance, in one sample which Sylvania built for WADC, aluminum foil 0.0025 in. thick was used with a paper dielectric only 0.002 in. thick. This gives a total spacing between turns of only 0.0045 in., compared to 0.02 in. for printed circuit techniques, permitting 4-5 times more turns in any given diameter. For low-voltage transformers, an adhesive or film-type dielectric coated directly on the metal foil could result in even more compact construction.

▶**Rectangular Conductors**—One inherent advantage of the new process is that it uses rectangular instead of round conductors, giving more efficient space utilization. The thickness of the wafers into which the tube is sliced is determined by the current-carrying capacity required. For instance, if the equivalent of a No. 44 wire is needed, and a foil 0.00017 in. thick is used, the wafers are cut to a thickness of approximately 0.017 in. Following slicing, wafers are etched to remove burrs, sprayed with a resin to insulate adjoining turns, and are then ready for stacking.

▶**Stacking Wafers**—Wafer coils destined for transformer use are initially wound to provide a large center hole.

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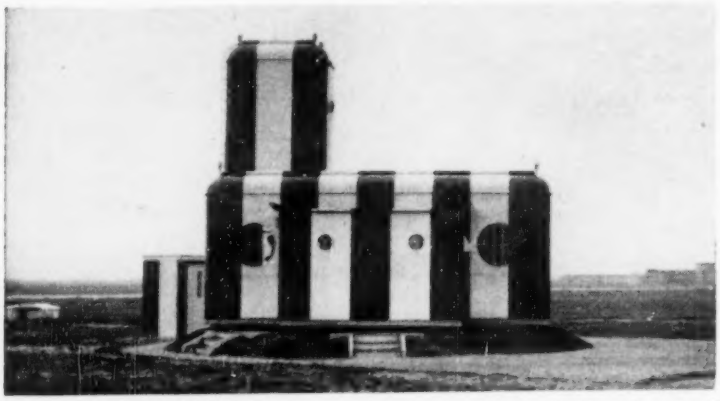
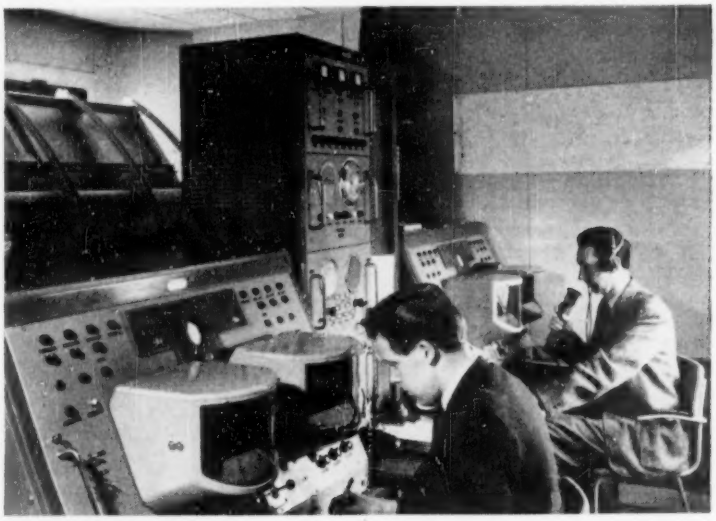
Aviation Week Picture Brief

Dutch Radar Merry-Go-Round



DUTCH TURNTABLE GCA, a precision approach radar which can be rotated to serve several runways, has been in operation at Schiphol Airport, Amsterdam, since 1951, the Netherlands Civil Aviation department has advised Aviation Week. The Dutch unit predates the similar turntable radar developed by the Rome Air Development Center (Aviation Week Aug. 17, 1953, p. 290).



TURNTABLE HOUSE, containing radar antennas and operators consoles, can be rotated up to 360 degrees at 36 deg./min. Turntable design originated with Netherlands Department of Civil Aviation. The PAR installation was built by Compagnie Francaise Thomson Houston in Paris.

They are then stacked on a suitable core (see exploded view, p. 68) and interconnected by means of small tubular tabs placed at the start and end of the foil windings, or by other similar means.

Several wafers may be grouped together on the core, separated by an air space from the adjoining group, in radiator-fin fashion to improve heat dissipation.

► **Comparison**—On the basis of limited samples made to date, the size and weight of small audio-frequency transformers built with the new Sylvania technique are essentially the same as units of conventional construction, Albert Zack told AVIATION WEEK. Frequency response over the middle audio range (300 to 12,000 cycles) has been "no better, no worse," than for conventional units, according to Zack.

Under an extension of the original WADC contract, Sylvania is to explore the application of the new process to the manufacture of pulse and high-temperature power transformers (approximately 100 va.).

Improved Precision Resistors Announced

A wire-wound resistor which is suspended in Silastic and then encapsulated in a non-hygroscopic resin to make it impervious to moisture is one of several new types of precision resistors recently announced. The new "Rhomized" encapsulated resistor can withstand temperatures up to 500F and is available to tolerances of 0.1%, 0.25%, 0.5% or 1%.

Manufacturer is Rho Engineering Co., 4205 Sepulveda Blvd., Culver City, Calif.

Other precision resistor developments include:

• **Ceramic-case version** of Aerovox Corp.'s Carbofilm line, designated Type CPC, provides hermetic seal and prevents a capacitance effect between the element and its case. Units are available in tolerances of 1%, in ½-, 1-, and 2-watt sizes. Hi-Q Div., Aerovox Corp., Olean, N. Y.

• **Wire-wound encapsulated,** non-inductively pie-wound on steatite bobbin, reportedly exceed MIL-R-93A, Amendment 2, at 125C. Units are available in resistances up to 1.95 megohms, tolerances as close as 0.1%, in ¼-, ⅜-, ½-, ¾- and 1-watt sizes. Ohmite Manufacturing Co., 3664 Howard St., Skokie, Ill.

• **Glass-encapsulated,** inert-gas-filled carbon-filled resistors, Models RX3,-4,-5, provide up to 15 kv. operation, resistance ranges of 200 to 650 kilohms, in 5-, 10-watt ratings, minimum tolerances of 1%, temperature operating range of −65C to 225C. Victoreen Instrument Co., Components Div., Cleveland, Ohio.

• **Miniature encapsulated** wire-wound, Type EM, designed to MIL-R-93, is available in resistance ranges of 10 to 30,000 ohms (or higher on special order), tolerances of 0.01 to 1%, full wattage to 350F, and temperature coefficient of 0.00002/Deg. C, according to manufacturer. Eastman Pacific Co., Electronics Div., 2320 E. 8th St., Los Angeles 21, Calif.

• **High-frequency miniature.** Type HFR, ¼ watt, is constructed of ceramic rod to which thin resistive film is bonded. Unit comes in standard tolerances of 5, 10, and 20%, reportedly exceeds MIL-R-10683A. International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.

Makers Give Details Of New Transducers

A tiny accelerometer, called "world's smallest" by its manufacturer, is one of several recently announced transducers suitable for missile and aircraft

Cummins Portable Electric Drill—product of John Oster Manufacturing Co., Milwaukee, Wis.

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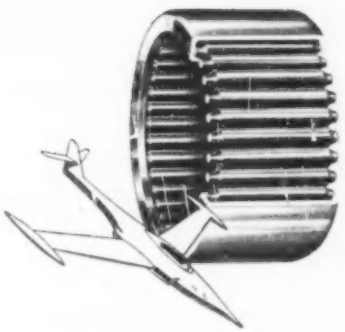

Torrington Needle Bearings serve the aircraft industry in many important applications where weight and space savings are vital. On both military and civil aircraft, Needle Bearings give high-capacity anti-friction performance at high speeds, high altitudes and over a wide range of temperatures.

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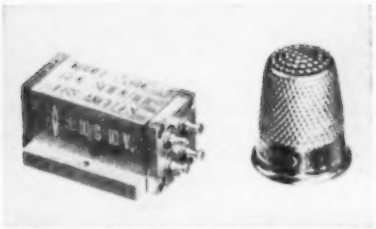


SMALLEST accelerometer, says maker.

instrumentation and telemetering purposes.

Made by General Scientific Corp., Los Angeles, the sub-subminiature strain-gage type accelerometer is thimble-sized, weighs 14 grams, and offers an operating range of 0.5 to 100G with a reported accuracy of 1% full scale. Natural frequency is quoted at 30 to 250 cps., with 0.7 damping factor. Model number of the tiny accelerometer is 2700-77.

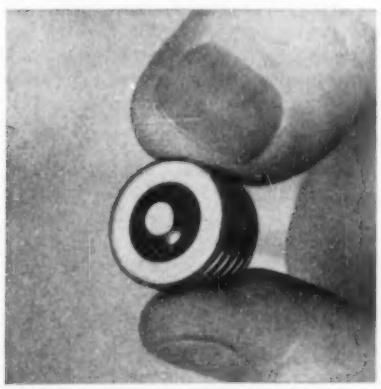
Another General Scientific accelerometer is self-generating, requires no external excitation. This model, 6000-79, develops output voltage as high as 2 v. and can be operated up to 550C. The device can be obtained with a sensitivity of 0.003G and a frequency response range of 2-350 cps.

Another new transducer, for use as temperature detector, operates in the range of −70 to 200C. Made by Thomas A. Edison, Inc.'s Instrument division, Model 221 N90A has a reported accuracy of 1% or better in mid-scale region and a time constant of 0.8 second or better. It is hermetically sealed. The company's address: West Orange, N. J.

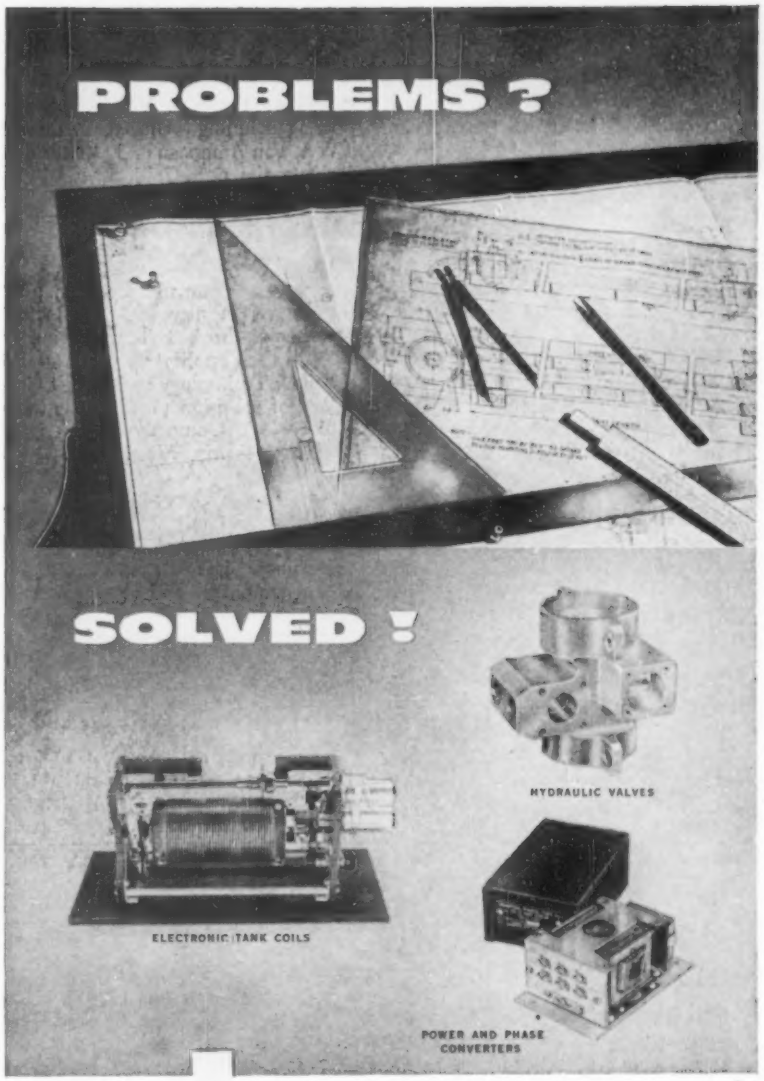
New Avionic Switches Come in Small Sizes

Circuit switching devices in a variety of types suitable for avionic use, have recently been announced. They include both switches and relays. The devices are:

• **Button switch,** consisting of a set of



DIAPHRAGM is helium-filled.



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movable contacts enclosed in a helium-filled accordion-like diaphragm, is designed for use where environment-free switching is required. Manufacturer says switch can be made in any size. Slater Electric & Manufacturing Co., Inc., Woodside, N. Y.

• **Rotary-selector switch,** consisting of from two to eight miniature Micro Switches ganged and actuated by individual cams, provides from two to eight detent positions of the operating shaft. An eight-switch assembly requires a 1⅞-in. dia. mounting surface, has an overall length of less than 4 in. Individual switches are SPDT, rated 3 amp. (inductive) at 30 v. d.c., 10 amp. at 125 or 250 v. a.c. Designation is 17A58.

Manufacturer is Micro Switch, Freeport, Ill.

• **Double-break switch,** snap-action type, permits simultaneous make and break of two isolated circuits. It measures ½ x ½ x 1¼ in. This is also made by Micro Switch.

• **Midget relay,** Series 80, has multiple contacts rated at 3 amp. (non-inductive) at 24 v. d.c., or 115 v., 60 cps., or with silver contacts rated at 5 amp. Relay is available in hermetically sealed containers or exposed. Bulletin MTR gives details. Manufacturer is Signal Engineering & Manuf. Co., Long Branch, N. J.

FILTER CENTER

► **Airlines Try New VHF**—Several airlines, including United, American, TWA, Pan American and Western, will evaluate the new Collins Model 51X, 360-channel VHF receiver this summer.

► **Useful New Handbook**—Handy tool for engineers who use precision potentiometers is a new 207-page looseleaf handbook, chock full of engineering data on their application and use. Published by Technology Instrument Corp., maker of precision pots, the handbook sells for $2. Company address is 531 Main St., Acton, Mass.

► **Northrop Develops Quac**—New Northrop Aircraft digital computer, called Quadratic Arc Computer (Quac for short), digests telemetered flight data, computes and then transmits navigation instructions, presumably to a guided missile. Machine measures 60x40x33 in., can store 2,600 digits, computes at the rate of 5,000 calculations/second.

► **ECIC Report Due**—Final report by Battelle Memorial Institute on the procedures and requirements necessary to set up an Electronics Components Information Center (AVIATION WEEK Sept. 7, 1953, p.40) to provide industry with application engineering data on suitable avionic components, is expected soon at Wright Air Development Center's Electronic Components Lab. Observers speculate that Battelle might set up an ECIC if WADC is unable to finance it with USAF funds.

► **Unhappy Exhibitors**—Exhibitors at the recent Dayton airborne electronics conference were unhappy over top-level decision which prevented many Wright Air Development Center engineers from attending the three-day convention. WADC engineers who wanted to spend more than two hours at the convention had to do so on their own time.

► **Color Storage Tube**—Hughes Aircraft is developing a three-color storage-type cathode ray tube for 3-D display of fire control information. Color of target blip will be used to show target range.

► **ICAO Act on Nav-Aids**—Consol, loran, or non-directional beacons were recommended as interim long-distance nav-aids by the International Civil Aviation Organization's Fifth Communication Div. during its recent

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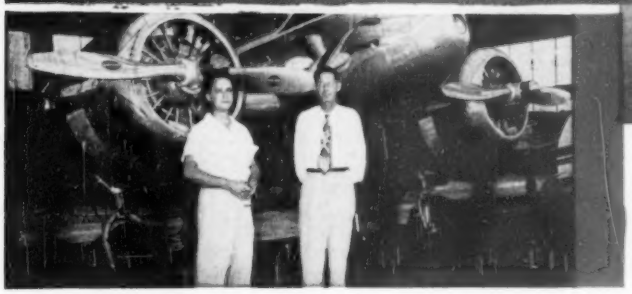

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month-long meeting in Montreal. ICAO recommended further development and evaluation of U. S. Navarho (AVIATION WEEK Apr. 26, p. 52) and its chief competitor, the British Dectra-Delrac system, as interim-system replacements after 1964. Other conclusions:

• **Secondary radar,** for use with airborne transponder beacons, should interrogate on a frequency of 1,030 mc., use 1,090 mc. for reply channel.

• **Airborne teletypewriter,** for ground-to-air transmission of meteorological and other route information, would relieve congested radiotelephone channels.

• **Airborne radar** does not appear to offer any solution to the air-to-air collision warning problem, but should prove useful for storm and terrain warning.

► **Be Specific**—Engineers should be more specific when stating ambient temperature limits for avionic components, Gordon Walter and Richard Hamilton of General Electric told the recent Electronic Components conference. Both are engineers in GE's aircraft transformer department. Their paper cited a design request for a transformer to operate for 2,000 hours at 125C. When further questioning revealed that the ambient temperature would be 125C for one-third of the operating time, 85C for the rest, it was possible to reduce transformer weight by 20%.

► **USAF Standardization Study**—Wright Air Development Center's Electronic Components Lab is studying possibility of industry-wide standardization of avionic components. First report on its study should be available toward end of this year. —PK

► **Avionics Literature** — Recently announced publications of interest to persons in the avionics field include:

• **Transistor curve tracer,** automatic tester for transistors. Magnetic Amplifiers, Inc., 632 Tinton Ave., New York 55, N. Y.

• **Plotter-recorder,** desk-size, will accept either an log or digital inputs (6 pp.). Librascope Inc., 1607 Flower St., Glendale, Calif.

• **A. C. servo motors** and tach generators, Cat. No. 4 (4 pp.). G-M Laboratories Inc., Dept. F., 4300 N. Knox Ave., Chicago 41, Ill.

• **Electric relays** (6 pp.). Advance Electric & Relay Co., 2435 N. Naomi St., Burbank, Calif.

• **Automatic control** products and engineering services of the J. B. Rea Co., including helicopter hovering control, digital autopilot, automatic cruise control, (16 pp.). Address: Santa Monica, Calif.

• **Vertical gyro indicator system,** remote indicating (16 pp.). Lear Inc., 110 Ionia Ave. N. W., Grand Rapids 2, Mich.

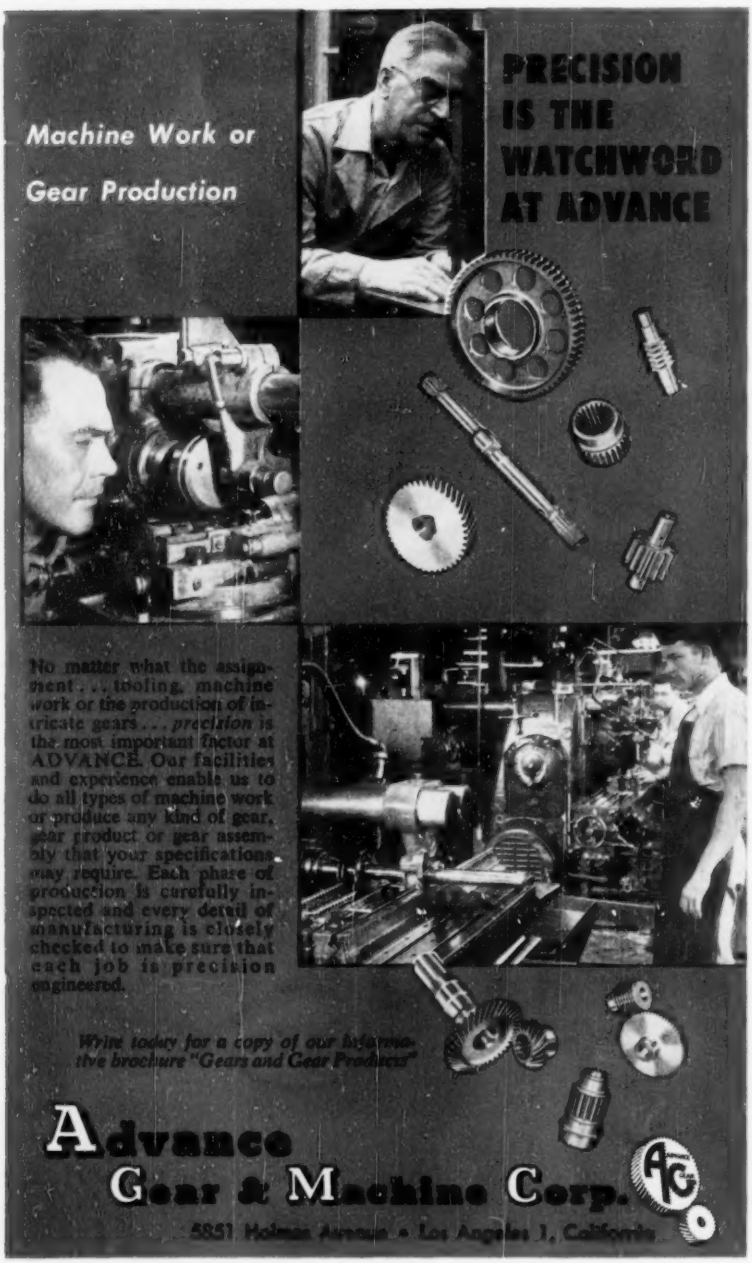
• **Sealed time-delay relay,** designed to MIL-R-6106 and MIL-R-5757B, with adjustable time delay; Bulletin SR5. AGA Division, Elastic Stop Nut Corp., 1027 Newark Ave., Elizabeth, N. J.

• **Hermetically sealed connectors;** bulletin. Electronic Sales Div., DeJur-Amsco Corp., 45-01 Northern Blvd., Long Island City, N. Y.

• **Noise in pots** is discussed in technical paper, "Electrical Noise in Wire-Wound Potentiometers," Technical Information Service, Helipot Corp., 916 Meridian Ave., S. Pasadena, Calif.

• **Snap-action switches,** ultra-small Type V-3, and auxiliary actuators, some designed to MIL-S-6743; Cat. No. 74. Micro Switch, Freeport, Ill.

• **Saturating servomechanisms** are discussed in technical paper, "Design Considerations of a Saturating Servomechanism"; Bulletin R-13. Cook Electric Co., 2700 Southport Ave., Chicago 14, Ill.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PRECISION
IS THE
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AT ADVANCE
No matter what the assignment . . . tooling, machine work or the production of intricate gears . . . precision is the most important factor at ADVANCE. Our facilities and experience enable us to do all types of machine work or produce any kind of gear, gear product or gear assembly that your specifications may require. Each phase of production is carefully inspected and every detail of manufacturing is closely checked to make sure that each job is precision engineered.
Write today for a copy of our informative brochure "Gears and Gear Products"
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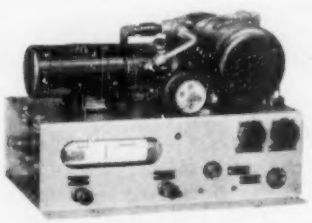
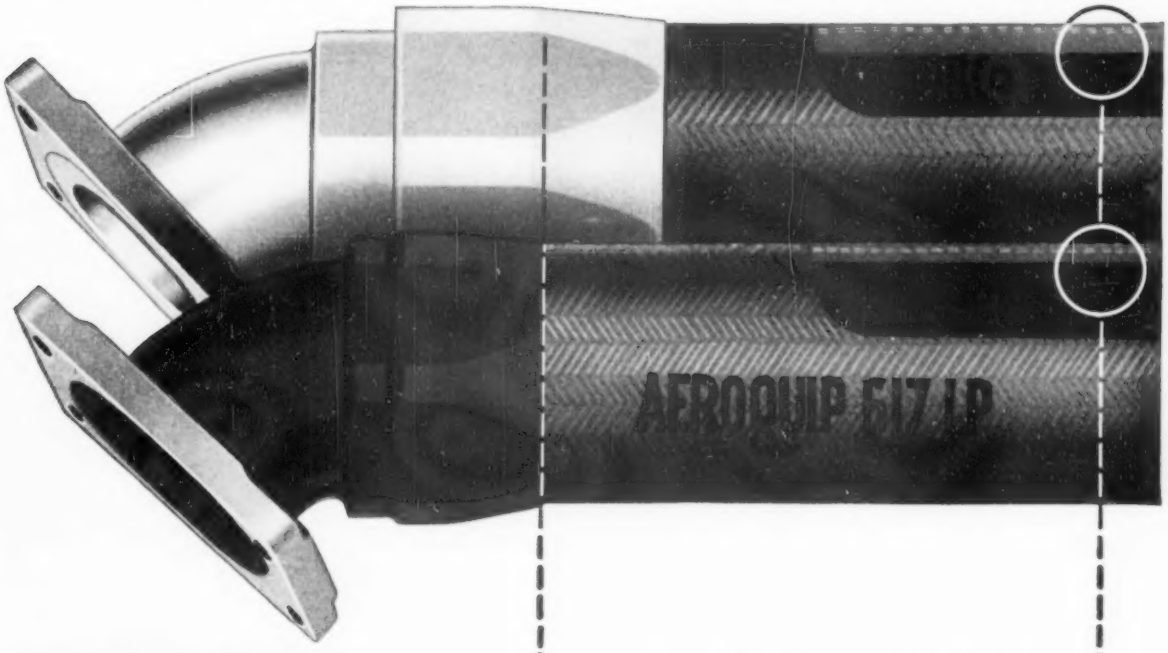


Altitude Pressurizer

New radar waveguide pressurization kit, rated at 200 cu. in./min., is designed to maintain sea-level air pressure at altitudes of 50,000 ft. Developed by Lear-Romec for a new jet bomber fire control system, Model RR-10200B, using a two-stage compressor, is reportedly able to compensate for waveguide leakage of 63 cu. in./min at altitude with a 25% duty cycle.

Save up to 150 lbs. per Plane!

with Aeroquip 617 Lightweight Air Frame Hose



THE FITTINGS WEIGH LESS!

Extremely short socket design uses less metal . . . saves the difference in weight.

THE HOSE WEIGHS LESS!

Thin wall construction and less wire braid hold weight to a minimum.

Tests prove the savings in weight where Aeroquip 617 lightweight air frame hose replaces conventional types for fuel and oil lines. On one fighter plane, weight was reduced 35 pounds . . . on bombers, as much as 150 pounds can be saved with no sacrifice in performance.

Aeroquip 617 hose has been tested, approved and accepted for 125 P.S.I. operation. The Buna inner tube is resistant to synthetic lubricating oils made to specification MIL-L-7808 as well as petroleum products. Aluminum fittings are detachable and reusable.

617 hose and fittings are available from stock with AN756 flanges and standard AN818 swivel nuts in straight, 45° and 90° elbows. Sizes are —16, —20, —24, and —32.

This is another "Aeroquip first" featuring hose and fittings matched for guaranteed performance. Write for Aircraft Engineering Bulletin AEB-2.

Aeroquip

REG. TRADE MARK

AEROQUIP CORPORATION, JACKSON, MICHIGAN

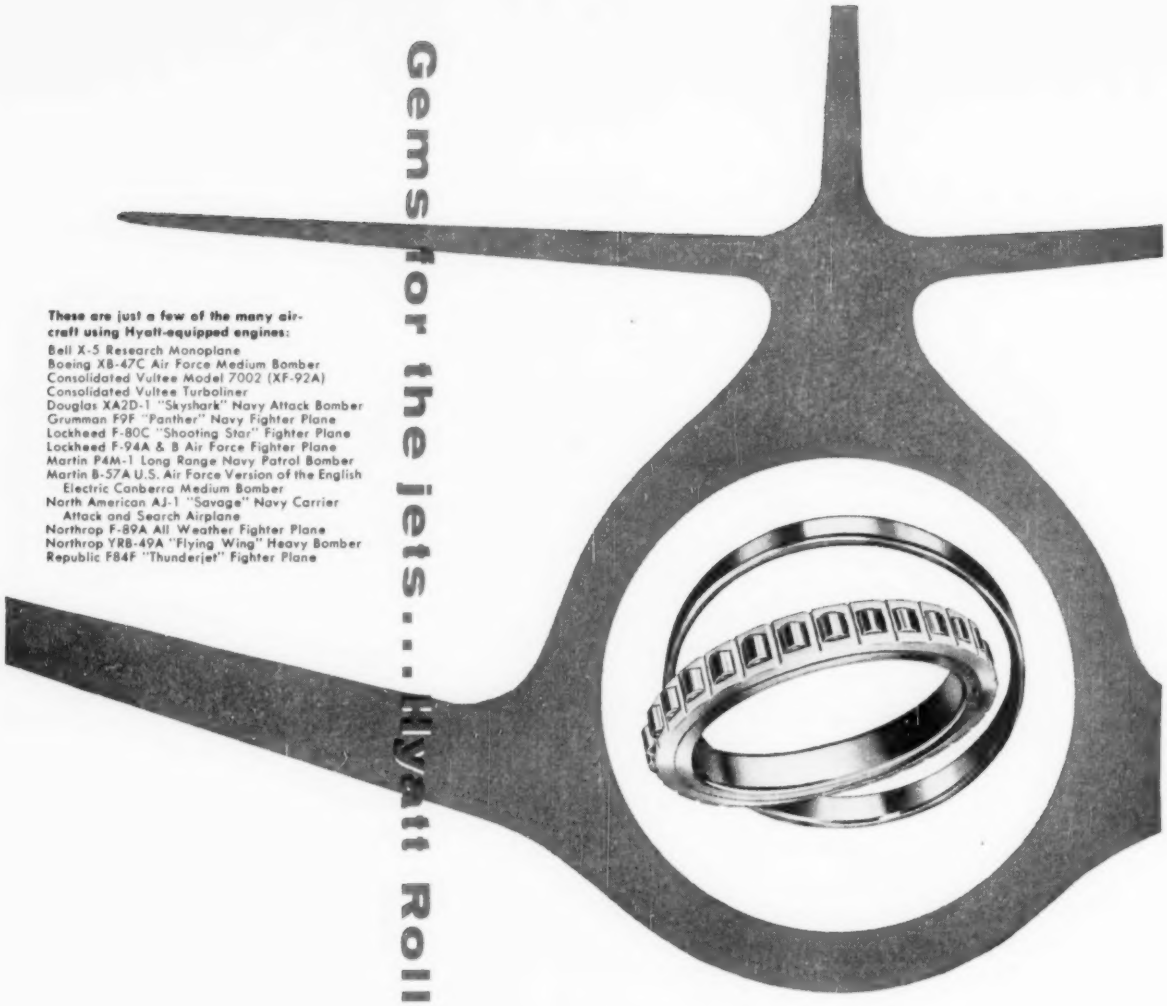
AERO-COUPLING CORPORATION, BURBANK, CALIFORNIA

(A Subsidiary of Aeroquip Corporation)

Manufacturers of Aeroquip Flexible Hose Lines with detachable, reusable Fittings; Self-Sealing Couplings; Brazed Aluminum Elbows

LOCAL REPRESENTATIVES IN PRINCIPAL CITIES IN U.S.A. AND ABROAD • AEROQUIP PRODUCTS ARE FULLY PROTECTED BY PATENTS IN U.S.A. AND ABROAD

Gems for the jets... Hyatt Roller Bearings!



These are just a few of the many aircraft using Hyatt-equipped engines:

Bell X-5 Research Monoplane
Boeing XB-47C Air Force Medium Bomber
Consolidated Vultee Model 7002 (XF-92A)
Consolidated Vultee Turboliner
Douglas XA2D-1 "Skyshark" Navy Attack Bomber
Grumman F9F "Panther" Navy Fighter Plane
Lockheed F-80C "Shooting Star" Fighter Plane
Lockheed F-94A & B Air Force Fighter Plane
Martin P4M-1 Long Range Navy Patrol Bomber
Martin B-57A U.S. Air Force Version of the English Electric Canberra Medium Bomber
North American AJ-1 "Savage" Navy Carrier Attack and Search Airplane
Northrop F-89A All Weather Fighter Plane
Northrop YRB-49A "Flying Wing" Heavy Bomber
Republic F84F "Thunderjet" Fighter Plane

When we entered the jet age, Hyatt was well prepared. Years of experience, unexcelled research facilities and modern production methods had already made us specialists in the manufacture of high-speed, high-temperature, precision roller bearings. So when the engine builders asked for better bearings of highest quality, Hyatt became a major producer . . . as early as 1944. Whenever design requirements are beyond the capabilities of ordinary bearings, call on Hyatt. Our staff of highly skilled sales-engineers is always at your service.

HYATT

STRAIGHT BARREL TAPER

HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION • HARRISON, NEW JERSEY

WHAT'S NEW

Telling the Market

Catalog of over 60 pages shows different types of **locknuts** available to the aircraft and allied industries. Write to Boots Aircraft Nut Corp., Norwalk, Conn.

Check Chart for Selecting Correct Paints is designed to enable maintenance manager to choose paint to meet his particular set of conditions. The chart is available from Wilbur and Williams Co., 130 Lincoln St., Boston 35, Mass.

Pratt & Whitney announces publication of illustrated 20-page catalog on its **Kellerflex Carbide Burs.** Address: West Hartford 1, Conn. . . . **The Turner System of Materials Handling** is 28-page booklet available from Factory Service Co., 4615 N. Twenty-first St., Milwaukee 9, Wis.

Southwest Products Co. is offering two new catalogs, one on **push-pull controls,** the other on **Monoball self-aligning bearings.** Write: 1705 S. Mountain Ave., Duarte, Calif. . . . **Creep testing machines** for metal specimens are described in 12-page Bulletin 4208 issued by Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

What is said to be the largest and most complete line of **snap-around volt-ammeters** on the market is described in Amprobe Catalog 134. Write Pyramid Instrument Corp., Lynbrook, N. Y.

New Office

Frederic P. Kimball, aviation consultant, has opened offices at 17 Main St., Westport, Conn. Telephone: Capital 7-2291.

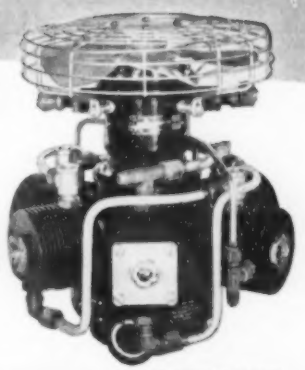
Publications Received

• **Table of Secants and Cosecants to Nine Significant Figures at Hundredths of a Degree**—by National Bureau of Standards, Applied Mathematics Series 40—Order from Government Printing Office, Washington 25, D. C.; 35 cents; 46 pp. The entries are considered correct to within six-tenths of a unit in the last place given.

• **Titanium and Titanium Alloys**—by John I. Everhart—pub. by Reinhold Publishing Corp., 330 West 42nd St., New York 36, N. Y. $3.00; 184 pp. A review of the work covered in various publications on titanium, supplemented with information obtained from the producers of the commercial materials.

• **Essays in Science**—by Albert Einstein—pub. by the Philosophical Library, 15 40th St., New York 16, N. Y. $2.75; 114 pp. An abridged edition of "The World as I See It."

Cornelius
PNEUMATIC
COMPRESSORS
FOR



CHANCE VOUGHT

CORNELIUS COMPRESSOR
4 CFM
3000 PSI
HYDRAULIC
MOTOR DRIVE

NAVY CUTLASS

Chance Vought Aircraft uses Cornelius air compressors on the F7U-3 Cutlass, supersonic Navy interceptor. In specifying Cornelius compressors, Chance Vought recognized the need for a compressor that would perform well at high ambient temperatures and altitudes.

These Exclusive Design Features Show Why Cornelius Air Compressors Run Cooler Than Any Other Compressor

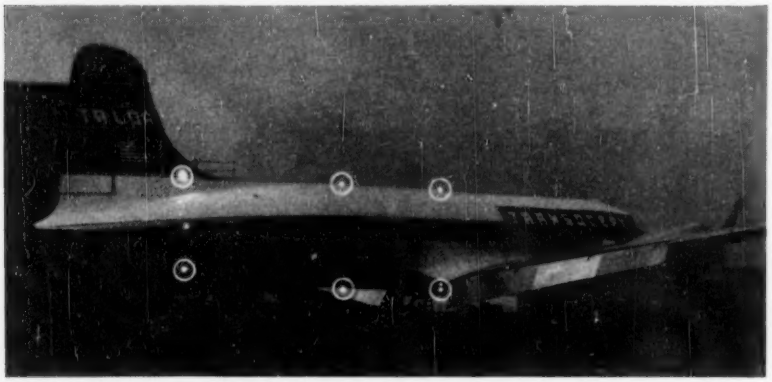
1. Heat of compression distributed over six cylinders.
2. Cooling fan is 8 inches in diameter with 1⅛ inch pitch.
3. Cooling fan turns at 5000 RPM.
4. The six cylinders have a total fin cooling area of approximately 950 square inches.
5. Intake valves are located in sides of cylinders—not in hot cylinder heads.
6. Finned cylinders are made of aluminum to provide for more rapid heat transfer.
7. Heat generating piston rings are not used.

If you have a requirement for a compressor to operate under high temperature and altitude conditions, please permit us to furnish additional information regarding our units. We will also gladly supply compressors on consignment, to qualified users, for test and evaluation.

CHANCE VOUGHT
F7U-3 CUTLASS
Supersonic Navy Fighter

THE Cornelius COMPANY
MINNEAPOLIS 21, MINNESOTA

PIONEERS IN THE DEVELOPMENT OF AIRCRAFT PNEUMATIC SYSTEMS



HIGH-INTENSITY FLASHTUBES (circled) indicate distance and direction of motion of aircraft. Six of seven lights are shown; seventh is on opposite side of tail.

Taloa Tests Anti-Collision Lights

Oakland, Calif. – Transocean Air Lines is testing a new system of aircraft lighting which promises to reduce chances of mid-air collision by clearly indicating an aircraft's direction of movement, position, and attitude.

Inventor of the system is a Transocean pilot, Capt. Andrew Madsen, who also is director of research for the airline.

The system of "Madsen Lights" consists of seven high-intensity flashtubes mounted on the top and bottom of the aft fuselage and flashing in a rapid aft to forward sequence.

► **Parallel Dasher**—These lights, identical with the ones used in stroboscopic photography, give the impression to the naked eye of parallel dashes of brilliant white light moving in the direction of the aircraft's motion.

Due to the high intensity of the flashes, the "lines" may be seen at great distances. The size of the space separating the two lines gives an indication of the distance of the aircraft from the observer. It likewise is quickly apparent in which direction the aircraft is traveling.

The lights also are visible in the daytime.

The illusion of motion is obtained by flashing the lights at a ½-sec. time interval between each set of bulbs. Each flash lasts approximately 1/600 sec. Sequences occur 40 times a minute.

Since the eye retains the image briefly, the sequence appears not as three sets of dots but as an optical illusion of two parallel lines. A still camera with an open shutter, however, will pick up three sets of lights, not two lines. The system contains a seventh light due to the necessity of placing one bulb on each side of the tail fin.

► **Test Installations**—The Madsen lights have been installed on a Transocean DC-4 since April. Reaction from pilots, tower personnel and CAA observers has been favorable. Six other test installations will be made soon. United Air Lines is considering a test of the lights on its domestic routes, Transocean reports.

Intensity is sufficient to be visible in the daytime at three miles against a bright sky, thereby reducing the collision hazard during the day as well as at night, the airline reports. On a clear night, the San Francisco tower reported it could determine the position and motion of the Madsen-equipped DC-4 when over the Farallon Islands, more than 30 miles away.

The lights have been observed at night in light rain at a distance of 17 miles. "They are graphic at 10-12 miles," Madsen says. "Beyond that, they are semi-graphic but not alarming." He believes the lights offer much more positive information than flashing red beacons now in use.

The Madsen lights fill the primary requirement for aircraft lighting of making the airplane conspicuous. Their high intensity plus the apparent motion attract attention quickly, even in the area of side-vision, the inventor says. They cannot be confused with lights on the ground as sometimes happens with other types of aircraft exterior lighting. The Madsen lights are visible even against a brightly lit city.

They also fill the secondary function of defining course and attitude of the aircraft.

Madsen reports the apparent motion of the lights can be seen even at low angles-off when approaching ahead or astern.

► **Light Weight**—The first DC-4 test installation weighs approximately 20 lb. The six others now being turned out for experimental use by airlines and the government weigh about 11 lb. each.

The system includes:

- **Step-up power transformer** to raise the aircraft alternating current to the voltage necessary for flashtube operation.
- **Rectifier** to convert the high-voltage alternating current to high-voltage direct current for charging the condenser.
- **Condenser** to store the electrical energy necessary for the discharge through the flashtube. Electrical energy is stored for a period of 1.5 sec. and used in 1/600 sec.
- **Xenon-filled flashtubes** in which a high-voltage pulse ionizes the gas, making it conductive and permitting the condenser to discharge through it to create the flash. The flashtubes used in the system are the same as those used in photography and have a life expectancy of at least 1,200 hrs. each.
- **Rotary cycling device** to operate the system in a proper sequence.
- **Necessary wiring and fixtures.**

Madsen reports that in flight the lights, despite their intensity, are hardly noticeable to passengers and crew. In clouds, he says, they are not as evident as the flashing incandescent lights now in general use.

Although he does not wish to commit himself to a definite figure, Madsen estimates cost of a complete aircraft installation will be "well under $500."

—WJC

UAL Expands Base For DC-7 Fleet

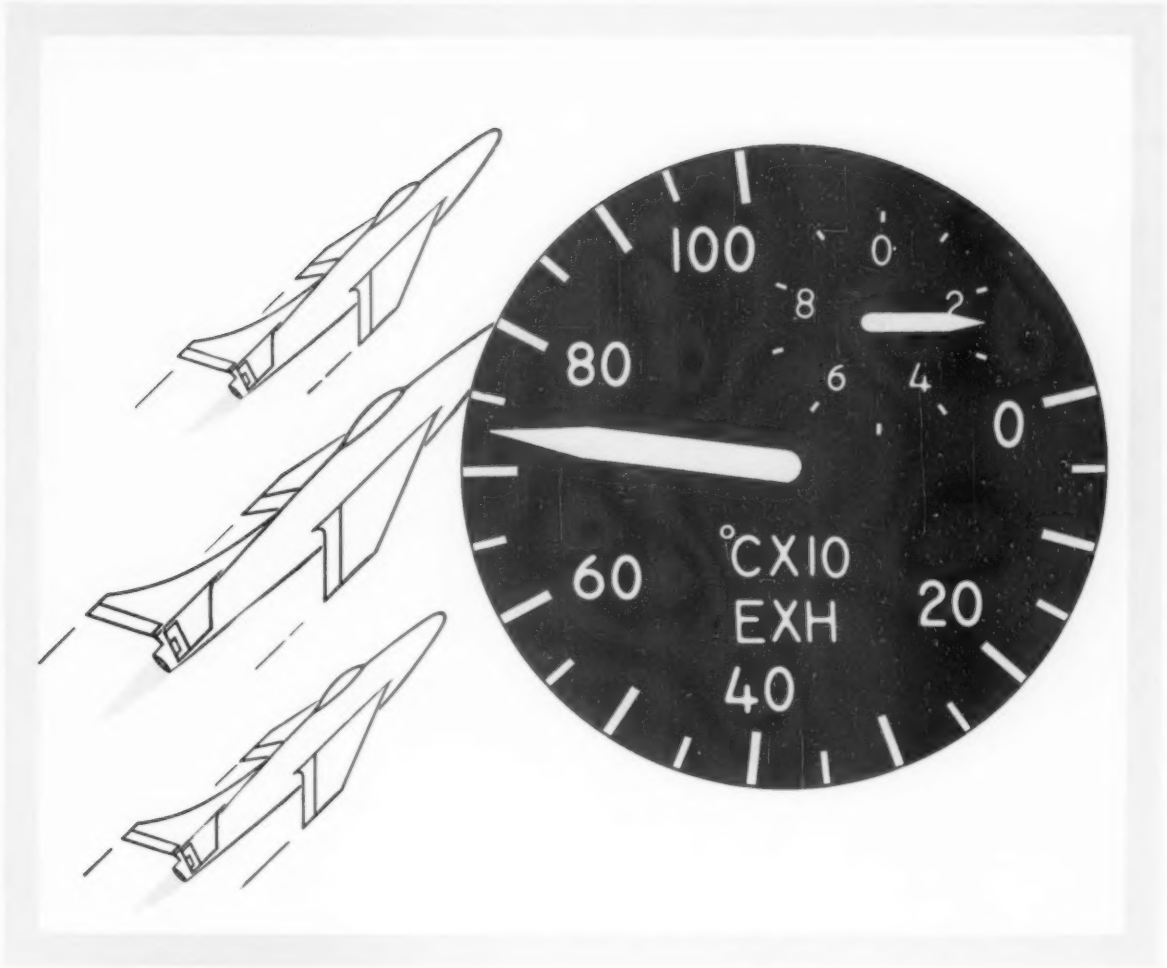
San Francisco—United Air Lines is expanding its large maintenance base here to accommodate the fleet of 25 DC-7s now going into service on its routes.

United's DC-7s are flown directly here from the Douglas Aircraft Co. plant at Santa Monica for a seven-day "pre-service" period. During this, the airliners are modified to United standards.

► **Bursting Seams**—The maintenance base is situated on 129 acres adjacent to San Francisco International Airport. Its overhaul docks, inspection and test facilities, and repair and manufacturing shops are among the largest and most modern in the world. Even so, an expansion to handle the increased fleet has been necessary.

"Addition of the DC-7s and our Convair 340s required this—not because of anything peculiar to the aircraft but due simply to the additional number," explains J. A. Herlihy, vice president, engineering-maintenance.

Work force in the shops will go up



HOW HOT CAN A "HOT" JET GET?

Avien's EGT system tells you—4 times more accurately!

The hotter the operating temperature of a jet engine, the more efficient it is. But only up to a point! Beyond that critical point, heat can effect serious metallurgical changes – and cause disaster.

Previous exhaust gas temperature systems permitted accurate indication only to ±20°C, even under the most favorable service conditions.

Avien's EGT system is accurate to ±5°C *under all service conditions!*

Avien's EGT employs a standard thermocouple mounted in the jet tailpipe, as other systems do. But there the similarity ends. Avien's EGT includes:

- A self-balancing bridge that makes the system independent of lead length and lead resistance.
- An improved method of compensation that eliminates effects of ambient temperature over a range of −55°C to +70°C.
- An easy-to-read main dial *and* a vernier dial which permits readings to within 2°C.

Add up these improvements, and you quickly see why Avien's EGT system permits jet operation closer to the critical temperature point – and why every potential pound of thrust can be used with safety.

When you have an instrumentation problem, you'll find it pays to consider Avien's special engineering abilities and imagination. Every month, Avien produces over 10,000 major instrument components for the aviation industry. They have been specified for more than 50 different aircraft models.

Data sheets on Avien's EGT system are available.

— ENGINEERING IN DEPTH —

Avien

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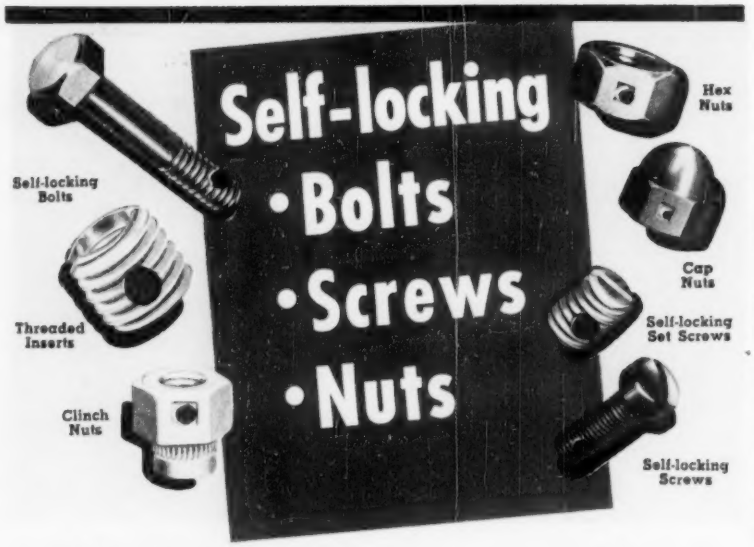
AIRCRAFT AND INDUSTRIAL INSTRUMENTATION

these NYLOK



will solve your fastener problems at *Lower Costs!*

NYLOK one-piece self-locking fasteners cut manufacturing and maintenance costs, give a better fastening, and improve product appearance. That's because NYLOK fasteners eliminate costly safety wiring, lock washers, jam nuts and other "extras".

The NYLOK principle* locks threads securely in any position, seated or unseated. The resilient nylon plug provides a smooth wedging action which is vibration-proof and will not mar mating surfaces. It provides a leak-proof seal where liquids are present.

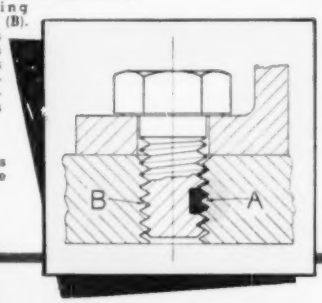
ONE-PIECE NYLOK CONSTRUCTION eliminates expensive extra locking parts, is always there so can't be left out or forgotten. This construction also means that NYLOK fasteners give you faster, easier assembly time. NYLOK fasteners can be re-used many times.

• Let NYLOK engineers help you solve your fastening problems. Write, stating your needs and NYLOK engineers will make recommendations at no obligation.

• *HOW NYLOK LOCKS •

Resilient nylon pellet (A) sets up lateral thrust, smoothly wedging mating threads together (B). All of locking action is on the threads: head is not stressed. Locking is positive, seated or unseated. Provides leak-proof seal where liquids are involved.

For full specifications and details of service approval . . . .



• HOW NYLOK SEALS

When the fastener is seated, one flank of the mating threads is in bearing. Therefor, liquids can only follow the helical path of the threads, and this helical flow is effectively dammed by the nylon pellet.

Write, Wire or phone today!

NYLOK Corporation

Manufacturers of Nylon-Locked fasteners covered by U.S. patents and patents pending

Main Offices and Factory — Elmira Heights, N. Y.

Offices in: New York City • Detroit • Chicago • North Hollywood

from 1,800 to some 2,000. A new building is under construction which will provide space for drop hammers, welding and sheet metal work on its lower floor, with engineering, purchasing and stores occupying the second floor.

A new hangar will house a DC-7 or two Convairs. This hangar also will take a jet airliner of 200,000-lb. size when the time comes, the airline executive reports.

Introduction of the DC-7's Turbo Compound engines into the overhaul facility has brought only a few new problems, according to the United vice president.

Special balancing equipment has been purchased for the Turbos but this also will be useful elsewhere, as in propeller work.

► **UAL Modifications**—Major modification undertaken during the seven-day "pre-service" period for the new airliners is adapting the forward cargo pit for baggage instead of passengers.

United will carry no passengers in this forward compartment. But since the compartment itself is smaller, United actually will lose a total of only two seats, giving DC-7s a 60-passenger capacity as against 62 for American Airlines, which uses the front compartment for passengers.

After tests made in a mockup of the new cargo pit, UAL officials decided it would result in much faster baggage handling, thereby cutting ground time for passengers. Since the suitcases will be on shelves, damage to baggage also will be less.

On routes other than nonstop it also will speed baggage handling for intermediate cities, since suitcases destined for such stops may be grouped on the shelves.

There is a rail for hanging garment bags as well as a hinged section which makes it possible to fit kennels into the shelves. Baggage will be loaded and unloaded through the access door of the crew compartment. The new baggage section will hold 65 suitcases.

Another modification includes removal of the righthand bulkhead in the crew compartment and installation of a folding observer's seat in front of the cargo door. This is for better checkout of flight procedures. For overwater service, this seat will be removed and overwater radio equipment installed in the space.

Many of the United installations are for safety purposes: inertia flashlights, evacuation slides, pilot's chest harness. Others now being designed are for passenger convenience: a plug-in baby crib for mounting on the forward cabin wall, a small card table for center armrests.

Other work during the "pre-service" check includes installation of seats,

beyond the sonic wall

precision *spells* performance!

New heights of performance, demanded by supersonic flight, also demand new standards of precision . . . precision assured by the know-how and production facilities with which we have served the aviation industry in development work for many years.

We manufacture precision gear assemblies for accessory drive units, actuators, transmissions, computers and controls. And we also produce complete components such as bomb hoists, gun turrets, radar tracking and scanning assemblies, hydraulic actuators.

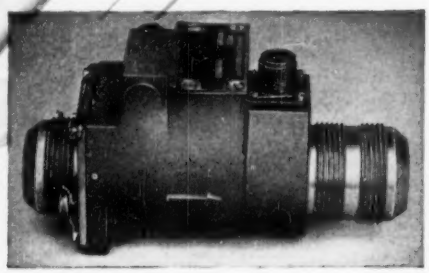
Make **your** development and production problems **our** problems. We're qualified by long and proven performance to solve them . . . large or small. A letter or telephone call will put us at your service.

THE STEEL PRODUCTS ENGINEERING CO.

ENGINEERS AND MANUFACTURERS • SPRINGFIELD, OHIO

AEROTEC FLOW INDICATOR

specified for USAF combat Jet



Behind the thousands of AEROTEC B-20004-RW Flow Indicators and Check Valves now in service are months of development and tests. An important safety feature of this control is a solid metal wall between switch housing and fuel chamber. The unit is designed to function at a specified flow rate and prevent reverse flow while operating in any position. Metal to metal valve seating eliminates O-ring swelling, sticking and assures long life. The AEROTEC B-20004-RW has passed Spec MIL-E-5272 and is suitable for fuels AN-F-32a, AN-F-48b, AN-F-58a.

Modifications to the following specifications of the B-20004-RW are available: Closes electrical circuit on increasing fuel flow at 400 lb. per hr. and above, reopening circuit when fuel flow decreases below 400 lb. per hr. Maximum pressure drop through valve not over 8" H_2O at 1000 GPH flow.

Check valve characteristics: Rate of leakage on reverse flow does not exceed 1 milliliter per minute when pressures from 75 psi to 4" fuel are applied to outlet port. Will withstand vibration frequencies of .010 double amplitude from zero to 100 cps and ±5 g's vibratory acceleration from 100 to 200 cps. Let AEROTEC'S qualified engineering staff help solve your automatic control problems in the aircraft field. One of our specialists is near, ready to serve you. Call or write him today.

When you think of Automatic Aircraft Controls, you should automatically think of AEROTEC.

Project Engineers

THE THERMIX CORPORATION

GREENWICH, CONNECTICUT

(Offices in all principal aircraft centers)

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THE AEROTEC CORPORATION

AIRCRAFT DIVISION GREENWICH, CONNECTICUT

Designers and Manufacturers of Automatic Controls—*Valves:* Regulating, Relief and Check types—*Pressure Switches:* Gage, Altitude, Differential and Absolute Types—*Float Switches:* Top, bottom or side mounted—Single, Dual, or Tandem.

carpets and food boxes.

United's DC-7s will be in transcontinental nonstop service from both San Francisco and Los Angeles to New York before the end of July. Scheduling of DC-7s on the Honolulu run still is "indefinite," the airline says, but is expected early next year.

NEW AVIATION PRODUCTS

Small Airborne Motor Delivers Smooth Torque

Clifton Precision Products Co. announces development of DC-8-A-1 permanent-magnet-type direct current motor for use in airborne navigational, fire control and photographic equipment. Diameter is ¾ in., length 1¼ in.

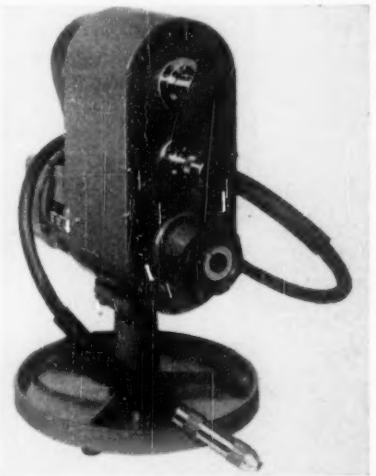
Unit is designed for 28-v. operation, but other voltage ratings are available.

No-load speed is 25,000 rpm. and minimum stall torque is 1.0 oz. in. Useful power at the shaft is more than 6 watts at 12,000 rpm., and maximum efficiency exceeds 70%, Clifton says.

Motor features 12-section commutator which enables it to deliver torque smoothly without cogging effects at low speeds, Clifton says. To minimize noise interference, an internal condenser is incorporated across the brushes.

Unit is available with either lead or screw-type terminals.

Clifton Precision Products, Inc., Maple at Broadway, Clifton Heights, Pa.



New Hand Grinder Offers 700-50,000 Rpm. Range

Metal Removal Co. is introducing a new hand grinder with speeds variable from 700 to 50,000 rpm.

Known as "Ultra-Flex," unit has

World's largest—Ryan fuel tanks for B-47 Stratojet

THE PROBLEM: The world's fastest bomber, the far-ranging B-47 Stratojet, needed the world's largest wing fuel tanks . . . tanks with a capacity equal to that of a good-sized tank truck. What's more, these tanks had to be completely gas-tight by welding alone. THE SOLUTION: Boeing turned to Ryan who devised ingenious methods to manufacture in volume the huge, external tanks —each of which requires more than 30,000 electrical spot welds.

Besides developing and manufacturing products of its own design, Ryan produces airframe components to prime contractors' specifications. Typical of these are other "range extending" products, like the Ryan-built aft fuselages and refueling pods for Boeing's KC-97 mid-air refueling plane.

These accomplishments point up Ryan engineering skill . . . skill that has been *specialized*, *ingenious* and *versatile* for 31 of the 50 years since powered flight began. Master craftsmen, Ryan does the *difficult*, the *intricate*, the *precision* jobs of today's high-speed air age.

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Dept. 5, 12800 Shaker Boulevard Cleveland 20, Ohio

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Manufacturer states it is simple and economical to operate since wear is minimized by omission of gears from the design. It will actuate carbide burrs, mounted wheels, abrasive disks, buffing wheels and grinding wheels from ⅛ in. to 7 in. in diameter.

Metal Removal Co., 1546 N. Orleans, Chicago 10.

DIE-CUT wrench is custom-made.

Die-Cutting Trims Cost Of Custom Wrenches

Process for manufacture of custom-made die-cut wrenches in small lots without conventional tooling costs is reported by Dayton Rogers Mfg. Co. The company employs a stamping method for production of almost any type of box or open-end wrench in place of common drop-forge mill wrenches.

Units reportedly can be made in any size up to and including an overall length of 20 in. They can be blanked and pierced from almost any sheet metal alloy and heat-treated to the desired specification, the manufacturer says.

Under this process, die life is said to be good for about 10,000 pieces. Initial cost of the first hundred wrenches shown above was $210, notes company, with subsequent hundred runs priced at $70.

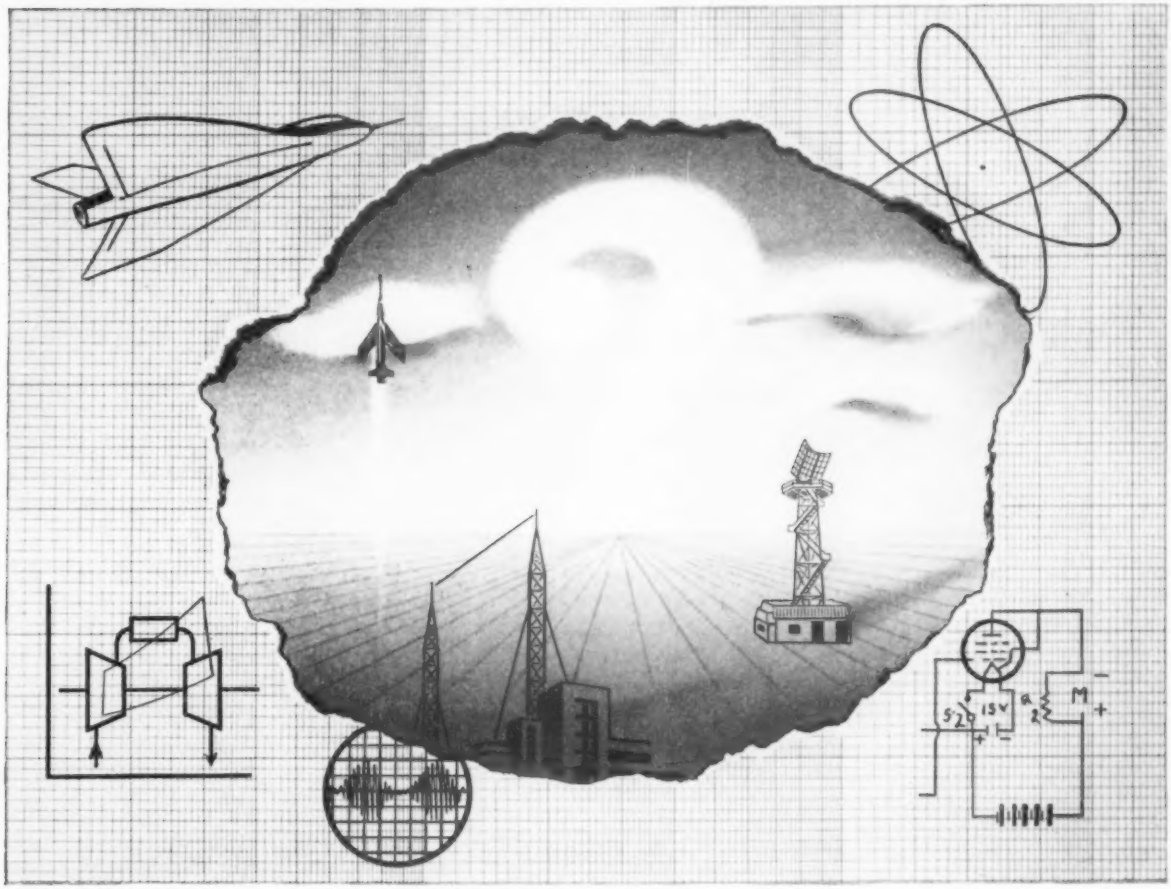
Dayton-Rogers Mfg. Co., Minneapolis 7, Minn.

Electric-Grade Plastic Easy to Machine, Drill

National Vulcanized Fibre Co. has developed a paper-base electrical grade melamine plastic which reportedly is easier to machine than other plastics of this type.

The new high-pressure laminate is said to possess excellent dielectric strength, low dissipation factor and good moisture resistance. Its arc resistance is approximately midway between paper-base phenolic (NEMA

NEW HORIZONS IN ENGINEERING



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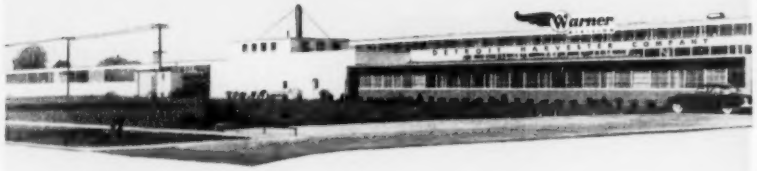

Warner Doubles Plant Facilities
Steps-up Precision Subcontracting Work

THE Warner Division of Detroit Harvester Company has moved into a new and larger manufacturing plant.

In addition to permitting an increase in the production of hydraulic units of their own design, such as pumps, valves and actuators, this expansion places Warner in a position to take on additional precision subcontracting work for aircraft and ordnance plants.

Capitalize on Warner's ability to manufacture to exacting tolerances.

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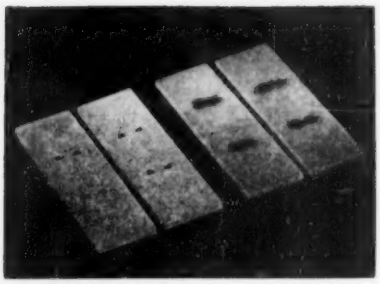

NEW PLASTIC (left pair) has better arc resistance than old (right).

Grade XXX) and paper-base melamine (NEMA Grade XX-M), says the manufacturer.

The melamine polyester reportedly can be punched in thicknesses up to ⅛ in.; a maximum of 1/32 in. is possible for comparable melamines used in electrical applications. Sections up to ⅜ in. can be shaped by shaving dies. It can be drilled, sawed, turned and milled using standard tools.

National Vulcanized Fibre Co., Wilmington, Del.

HOLDER for throw-away carbide blank.

No Carbides to Grind With Holder-Blank Setup

The combination of a new tool holder and "throw-away" carbide blanks eliminates the need for carbide grinding. Developed by Vascoloy-Ramet, the throw-away blanks are available to fit all sizes of triangular, square and round toolholders for use on all cutting edges without grinding.

The toolholder is designed with a "built-in" carbide chipbreaker, said to provide correct chip formation over wide cutting range for single chipbreaker width, eliminating all chipbreaker grinding.

The toolholders are also available with neutral rake or negative rake. The rake reportedly is easily changed without removing the toolholder from the tool post by a simple interchange of parts.

The company says the toolholder eliminates tool cracking caused by brazing strain, and loss of a complete brazed tool due to carbide failure; it keeps cutting edge automatically positioned.

Vascoloy-Ramet Corp., Waukegan, Ill.

FROM BLUEPRINT TO BLUE SKY . . .

28,000 INSPECTIONS

Exceeding even rigid Air Force requirements, the Fairchild-Air Force Quality Control team puts every C-119 through more than 28,000 different inspections before its initial acceptance flight.

Working under inspection principles regarded as a model for the entire aircraft industry, the Fairchild Quality Control team insures topmost quality in tools, materials, parts fabrication and assembly.

This includes inspection of the more than 22,000 parts that go into a "Flying Boxcar" as well as more than 6,000 assembly-line inspection points.

The same strict safety insurance measures that guide C-119 inspections are applied equally to its new assembly-line mate, the Fairchild-built C-123. Together, they are testimonials to Air Force quality standards and Fairchild Quality Control and Production.

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In the Cleveland Pneumatic plant, the world's largest and most powerful general-purpose flash-butt electric-resistance welding machine is now at work joining aircraft components. This machine can butt weld high-alloy steel pieces having a total cross-sectional area of as much as 67 square inches. With low-carbon material, this area can be as large as 100 square inches.

A limited amount of this machine's extra time is available now on a contract basis. It can be useful to manufacturers who have the problem of getting highest-quality large-area welds on high-alloy steels at low unit cost.

Write for Booklet D-64, which describes this machine and its capacities, and also tells you how our Contract Welding Department can work for you.

Cleveland Pneumatic
Tool Company CLEVELAND 5, OHIO
Department C-64

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SAS Ready to Fly Polar Route to Tokyo

- **All operational problems solved, executive says.**
- **Japanese air agreement clears political barriers.**

By A. W. Jessup
(McGraw-Hill World News)

Tokyo—Scandinavian Airlines System has licked all operational problems on the proposed Europe-Far East polar route and may begin scheduled flights by next spring, SAS executive vice president Per M. Backe reports.

He says the second trial flight last month between Scandinavia and Tokyo proved to the airline's satisfaction that its transpolar route is ready.

▶ **Safe Service**—Navigational systems are developed enough, using the grid system and the Bendix "Polar Path" gyro compass to make the route as safe as any in the world, says Backe.

He discounts the effect of occasional radio blackouts that result from atmospheric disturbances over the polar regions. In the first place, these accurately are forecast two days in advance, so schedules can be canceled if necessary. He believes, however, that cancelations rarely would be necessary.

The longest blackouts are seldom more than three hours, and he sees no reason why planes should not fly over a route where they seldom would be more than an hour from some Canadian or U. S. air installation in America's Far North—even with occasional radio silences.

Weather is not considered any problem by SAS. The airline expects year-round conditions will be superior to any other route from Europe to the Pacific regions. All across the polar region, there is a clean dry air, with none of the up and down air currents of the temperate and tropical zones. In addition, there are no mountains.

▶ **32-Hr. Flight**—The DC-6B flight from Oslo—via Bodoe, Norway, Fairbanks, Alaska, and Shemya—to Tokyo took 32 hours flying time, including a diversionary arc over the North Pole. Normally, the Pole would not be a check point.

Flying time by regular routes from Europe to Tokyo, covering 2,400 additional nautical miles, is 44 hours.

In addition to chopping flight hours, SAS expects less ground time will be necessary. There are only three stops between Oslo or Copenhagen and Tokyo "over the Pole." With less air traffic, better weather conditions and probably less red tape, ground time for the trip may be kept to less than four hours. At least eight hours are required via the Middle East and South Asia.

The through passenger to Tokyo and East Asia also may find the stops more pleasant. The cleanliness of north Norway and Alaska are in distinct contrast with the tropical route.

▶ **JAL Interest**—No political problems loom for this operation. The bilateral agreements of the three Scandinavian countries and Japan include the polar routes. All SAS has to do is have the necessary letters passed to the Japanese government.

Japan Air Lines, of course, enjoys reciprocal routes over the polar regions to the Scandinavian countries. JAL is interested but does not expect to try transpolar flights until its trans-Pacific and Orient region lines are developed more solidly.

▶ **USAF Threat**—About the only operational problem SAS faces is the U. S. Air Force threat to close down operations at Shemya in the Aleutians. This would force some revision of the airline's plans to fly via Fairbanks and Shemya.

Northwest Orient Airlines also would be affected by this possible curtailment.

The SAS return flight went via Cold Bay at the base of the Aleutian chain to examine its possibilities as a base.

▶ **Easy Haul**—Later, when SAS receives its DC-7s, it may make the Europe-to-Tokyo hop in three flights, stopping only at Bodoe and Fairbanks.

From Tokyo to Europe, this should be an easy haul. Winds over the North Pacific are favorable for this flight. But headwinds increase the Fairbanks-Tokyo flight by two hours over the Tokyo-Fairbanks hop.

Some Japanese are apprehensive about the risks and dangers of the polar route.

Backe suggests that the Eskimos probably are less dangerous than sharks in certain of the ocean regions.

He also claims that there would be less difficulty "ditching" on the ice than in the ocean. And, the SAS executive adds, few passenger aircraft have ditched anyway.

SAS Los Angeles Agreement

Talks between the U. S. State Department and Scandinavian governments to revise the present bilateral air transport agreement probably will begin soon.

This is the immediate stipulation in the State Department's offer to provide Scandinavian Airlines System a West Coast terminus in the U. S. for the carrier's proposed transpolar route. SAS wants a new route across the top of the world from Scandinavia to Los Angeles via Greenland (Aviation Week Mar. 29, p. 59).

The United States asks for reciprocal rights to the same polar route, a three-year experimental limit on SAS operation, plus an exchange of data covering the route at the end of two years.

State Department has asked for an exchange of notes between the two governments in an effort to get negotiations started to revise the present air transport agreement. It is not likely the Scandinavian governments will buck the U. S. proposal, department spokesmen say, because SAS eagerly has sought the route to Los Angeles.

Last March, the ambassadors of Norway, Sweden and Denmark urged Undersecretary of State Walter Bedell Smith to seek reconsideration of State's earlier decision to grant SAS use of Seattle as its West Coast terminus rather than Los Angeles.

The airline says Los Angeles generates 10 times as much European traffic as Seattle. SAS also figures the flight will be three hours, 30 minutes shorter to Los Angeles than Seattle. The Scandinavian carrier also contends the difference between profitable and economically impossible operation is in the selection of Los Angeles over Seattle.

Once State and the Scandinavian governments are agreed on a revised agreement, SAS will apply formally to Civil Aeronautics Board for permission to fly to Los Angeles. CAB and the State Department already have agreed to approve the route (Aviation Week June 7, p. 7).

The issue to be resolved in upcoming talks is that providing for control of frequency of flights across the route within the terms of the Bermuda agreement.

SAS has announced plans to commence operating the transpolar route this fall. Tore H. Nilert, SAS president, indicates the U. S. request for reciprocal rights undoubtedly will be agreeable to Norway, Sweden and Denmark.

CAB Awaits AA Crew Time Reply

Civil Aeronautics Board last week awaited a reply from American Airlines to "satisfy the complaint" of Civil Aeronautics Administration that AA be forced to halt overtime operation of its east-west nonstop DC-7s.

American's westbound DC-7 flights are operating beyond the 8-hr. limit for single crews set by Civil Air Regulations. As of May 31, the airline has been unable to meet CAA Administrator Fred B. Lee's stipulation that it must operate half of its westbound nonstop flights within 8 hr. between April 20 and July 1 (AVIATION WEEK June 7, p. 112). AA's schedule is 7 hr. 55 min.

▶ **Gurney Letter**—CAA believes that, even though American could not keep within its schedule during the winter season, perhaps the more moderate summer climate would make such an operation feasible.

In a letter to American president C. R. Smith, CAB Chairman Chan Gurney says that since CAA's complaint "requests neither a proceeding for the enforcement of economic regulatory provisions of the Act or regulations issued thereunder, or for suspension or revocation . . . the procedure to be followed in relation thereto is not specifically prescribed by the Board's rules of practice.

"It does appear, however, that . . . American Airlines is entitled to an opportunity to satisfy the complaint before the Board determines whether to proceed with a formal investigation."

Gurney says the Board will determine what action must then be taken to "achieve compliance with the Act."

▶ **July 1 Deadline**—CAB has yet to decide on a waiver American requested to permit it to continue DC-7 operation beyond the 8-hr. limit. United and Trans World Airlines have joined AA in asking for extension to 12 hr., the limit for international operations.

In that connection, the Board already has announced it is considering amending the regulations to extend the 8-hr. domestic flight time limitation to 12 hr. for nonstop transcontinental flights with three crew members. Comments will be accepted until July 1.

▶ **Pilot Fatigue?**—Air Line Pilots Assn. claims that if pilots are permitted to fly 12 hr. a day, it would mean a 16-hr. working day. ALPA has told CAB it would "declaim responsibility for accidents resulting from over-fatigue-limits flying."

The pilots' union charges that American has been violating the regulations for six months. The government failed to put a stop to it until pilots insisted and AA then attempted to have the regulation changed "to make legal their illegal operation," says ALPA.

"Should these waivers be granted and an accident occur when the pilot has flown in excess by being scheduled under a waiver," says C. N. Sayen, ALPA president, "it is presumed that the finding might be 'pilot error.'

"We suggest that the error will not have been the pilot's and the responsibility must be assumed by those who would permit such a situation to arise."

New TWA Nonstop

Application for two nonstop coast-to-coast flights—New York-Los Angeles and San Francisco-New York—was filed last week by Trans World Airlines with Civil Aeronautics Board.

Scheduled time for the New York-Los Angeles flight was listed by TWA at 7 hr. 55 min. Flight time for the other route, San Francisco-New York, was listed at 7 hr. 35 min.

TWA's proposed flight time for New York to Los Angeles was called a "paper schedule" by the Air Line Pilots Assn. "This preposterous disregard for Civil Air Regulations is obviously engendered by American Airlines' disregard for government safety regulations, now in its seventh month without effective enforcement action by Civil Aeronautics Administration or CAB and indicative of what we may expect if the situation continues," ALPA said in an official complaint to the Board.

The airline said operations personnel calculated the schedules so that they can be met. TWA has been flying the eastbound Los Angeles-New York leg since last October and reports the flights have equalled or bettered the scheduled time for both eastbound and westbound routes of 7 hr. 55 min.

CAB Cuts $2 Million From Braniff Subsidy

Civil Aeronautics Board has given the first demonstration of a firm policy against reverting self-sustaining airlines to subsidy in an order reducing Braniff Airways' claim for 1954 domestic air-mail pay from $4.4 million to $2.3 million.

The Board makes these findings:

- Recommends against any subsidy allocation for Braniff's Route 9, which went off subsidy Oct. 1, 1951, but concedes that a "maximum subsidy" of $310,000 "might be claimed" by the carrier for this route.
- Proposes a subsidy allocation of $1,366,000 for Braniff Routes 26, 48, and 106, which represent the operations of Mid-Continent Airlines prior to the merger of the two carriers. The allocation, CAB says, is $203,000 less than the annual subsidy paid to Mid-Continent immediately prior to the merger.
- Disallows mail pay and subsidy resulting from replacement of DC-3s, DC-4s and Convair 240s in Braniff's fleet with Convair 340s. The Board bases its computations on seven DC-4s (which Braniff owns but is not operating in scheduled services) instead of seven 340s (in actual operations). The airline's domestic fleet consists of 24 DC-3s, 23 Convair 340s and four DC-6s.

Following the precedent set in the Pioneer Airlines case against underwriting new equipment with subsidy, CAB declares: ". . . The acquisition and introduction into revenue service of 23 Convair 340s within a relatively short period of time has resulted in a substantial increase in mail pay requirements over the level which would have obtained had a lesser number of Convair 340s been acquired and had some of the aircraft retired been continued in service. . . .

"It is settled Board policy . . . that equipment substitutions of this character which result in an unwarranted increase in subsidy requirements, will not be underwritten with increase mail pay. . . ."

The Board estimates that $959,000 of the total mail pay of $2,325,000 proposed for Braniff for 1954 is service mail pay, leaving the $1,366,000 subsidy for former Mid-Continent operations.

CAB Asks Subsidy Offset Legislation

Civil Aeronautics Board has urged Congress to pass legislation that would permit it to continue its practice of setting different mail pay rates for separate divisions of airlines.

A Supreme Court decision in the Delta-C&S Air Lines case rendered the practice illegal. Denying the carrier $654,000 back mail pay, the court declared that under the 1938 Civil Aeronautics Act subsidy must be measured by the "entirety" of a line's operation.

This would require that earnings of one division of a carrier offset the subsidy requirement of another division.

Endorsing a bill introduced by Sen. Pat McCarran that would authorize the Board to establish different rates "for different classes of services, including different operational or geographical divisions," CAB Chairman Chan Gurney reported to Senate Interstate and Foreign Commerce Committee: "The Board is in favor of this amendment since it believes that from the point of view of air carrier economics its former practice was sound and in the best interests of air transportation."

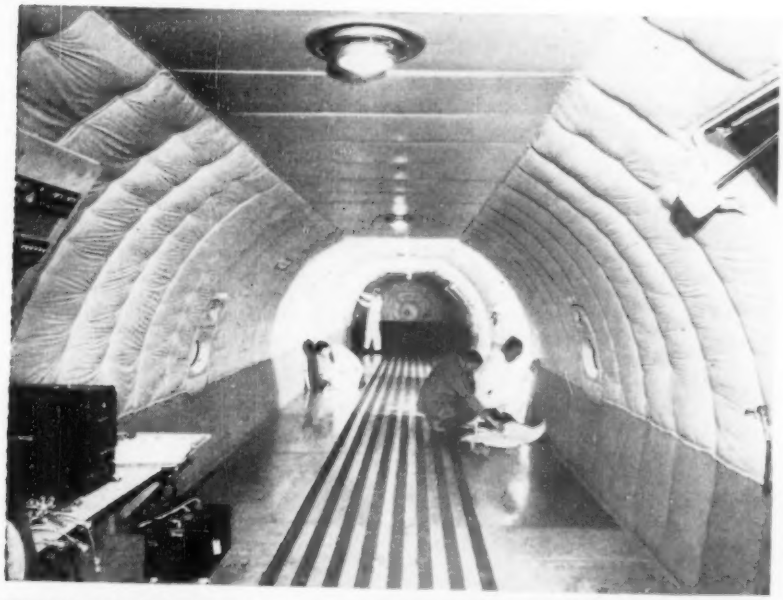
Douglas Forecasts 100-Passenger Jet

Los Angeles—From current jet engine developments will evolve commercial jet transports with a takeoff weight of 250,000 lb. and ability to carry 75 to 100 passengers nonstop to Europe, forecasts Donald W. Douglas, Jr., vice president of Douglas Aircraft Co.

At a luncheon meeting in honor of Airlines Day at the Downtown Optimists' Club of Los Angeles, Douglas told of two new types of turboprop airplanes he predicts will be flying commercially within the next 10 years:

- **A small- to medium-size** plane for short-range operations that will carry 50 to 75 passengers up to 450 mph.
- **A 400,000-lb. transport** capable of carrying heavy cargo loads or large numbers of aircoach passengers at low rates over long ranges.

"The airline industry will not, and must not, become complacent for its ultimate destiny has by no means been reached," Douglas says.



First Views of Boeing Jet Transport Cabin

Interior of the new Boeing 707 jet tanker-transport prototype (top photo), viewed from the control cabin, shows technicians checking the inside of the big plane in preparation for its first flight early next month. Visible at left is a portion of test instrumentation, further detailed in lower photo that looks toward the cockpit. Initial flight test phase of the 707 calls for 50 hr. of carefully charted flight to get aerodynamic data.

Colombia Building Five Big Airports

(McGraw-Hill World News)

Bogota, Colombia—A $21-million $25-million airport development program, which will result in five terminals capable of handling heavy air transports, has been started by this country.

The new airport construction includes:

- **Bogota International Airport,** $12 million-$16 million for a four-to-five-year project on which work began June 13. Two parallel runways, each more than 11,800 ft. long, will be constructed.
- **Cali International Airport,** where work also started June 13 on this $6-million project. A 9,500-ft. runway will be laid down here.
- **Barrancabermeja** near the large oilfields on the Magdalena River. A 6,000-ft. runway is planned. Construction, estimated at $2 million, began June 13.
- **Island of San Andres** in the Caribbean Sea, $600,000. Work is scheduled to begin in August, with plans including a 6,000-ft. runway.
- **Leticia International Airport,** $600,000, with work starting on a new 6,000-ft. runway in July.

IATA Unit to Study Airline Copter Use

International Air Transport Association has formed a helicopter committee as a "task force" to handle legislative and regulatory problems faced by rotary-wing transport operators.

The committee, an industry-wide group, will try to speed the possible early use of helicopters on international routes. It also will seek standardization and simplification of the aircraft.

A third field of activity, launched in 1953 at the IATA conference on helicopters at Puerto Rico, will be to develop airline views on what is required of the designer and manufacturer of transport helicopters.

New ICAO Officers

Montreal—International Civil Aviation Organization has elected Walter J. Binaghi of Argentina as president of its eighth assembly, now in session here.

New vice president: E. A. Gibson, New Zealand's director of civil aviation; group Capt. I. H. Gazarine, director general of Egypt's Civil Aviation Department; K. T. B. Koskenkyla, Civil Aviation Director for Finland, and Col. J. Tellez, Colombia.

C. W. Evans, Undersecretary to Britain's Minister of Transport and Civil Aviation, has been elected chairman of the administrative commission.

TWA Makes Strong Bid for Denver

Damon says his airline is 'tailor-made' to city's needs, claims approval would bolster transcontinental system.

General realignment of the parallel east-west transcontinental air routes of domestic U. S. airlines may result from the Denver service case now in the hearing stage before Civil Aeronautics Board examiner Ferdinand D. Moran. Crux of the case is additional service to Denver. Trans World Airlines planted the seed of the route case in 1945 when it asked the Board to add Denver to its routes between Chicago and Kansas City and California.

American Airlines entered the case to request Denver also, and United Air Lines, which serves Denver, countered with an application to serve Kansas City and other TWA and AA routes to the east.

▶ **'Tailor-Made' Service**—Ralph S. Damon, TWA president, told the examiner in the current hearing that Denver is more dependent upon air transportation than any city of comparable or near comparable size in the U. S. He claims existing air service is insufficient to satisfy present demands, "let alone the expanding needs of the future."

TWA's proposal, he says, is "tailor-made to Denver's requirements" and provides new or competitive service to the most important traffic markets in which the Colorado capital maintains strong interest. He calls Denver and the Rocky Mountain area "one of the fastest growing regions in the nation."

▶ **Aircoach Potential**—Damon says approval of Trans World's application would make available the first one-carrier service between Denver and a score of major cities—including Pittsburgh, Columbus, Dayton, Cincinnati, Indianapolis, Louisville and St. Louis. He adds that TWA also would offer a much-needed competitive service to seven of Denver's 10 leading traffic centers. He names New York, Washington, Philadelphia, Chicago, Kansas City, Los Angeles and San Francisco.

Board approval also would provide the first aircoach service between Denver and Los Angeles, Kansas City, St. Louis, Cincinnati and Pittsburgh, Damon says.

TWA firmly is convinced, the airline president reports, that the greatest opportunity for expansion in the air industry lies in the aircoach field. With the tremendous potential in Denver, he adds, Trans World would develop this market to the fullest extent possible "as it has done so successfully in other cities." He claims Denver has received only a limited amount of tourist service from United.

▶ **Route Balance**—As to AA's application, Damon says "It is unthinkable to me that the CAB would further enhance American's dominant position by extending its territory northward in the Rocky Mountain area from El Paso to Denver." He claims any semblance of balance in the transcontinental route structure would be completely destroyed if American's application were approved.

"There is a notable deficiency in the transcontinental pattern which the CAB should be careful not to aggravate by its decision in this proceeding," Damon warns. "Any action strengthening TWA would effect a sounder transcontinental system; and, conversely, any action giving further strength to United or American Airlines at the expense of TWA would seriously weaken this system."

Integration of Denver into its system network, he says, would be done with an absolute minimum of expense since practically no new mileage would be involved. TWA today flies almost directly over Denver on its coast-to-coast nonstop flights, he points out.

▶ **Operation Plan**—E. O. Cocke, TWA's vice president-sales, reports that if the Board approves Trans World's application, the airline is prepared to operate eight roundtrips daily to Denver.

This would include three Constellation aircoach flights, with express service to Los Angeles, Oakland, San Francisco, Kansas City, St. Louis, Chicago, Pittsburgh, Washington and New York.

▶ **Contestants**—Major parties involved:

TWA, American, Continental Air Lines and nonsked, North American Airlines requesting transcontinental service through Denver on their respective routes from Chicago and Kansas City to Los Angeles and San Francisco.

TWA now operates between Chicago and Kansas City and from both cities to Los Angeles and San Francisco. American flies Chicago-Los Angeles. Continental operates Kansas City-Denver.

Braniff Airways, requesting a Kansas City-Denver route. It now flies Chicago-Kansas City.

United, requesting American and TWA routes to the east because the other airlines seek to duplicate UAL's service through Denver.

Western Air Lines, requesting recertification on the Denver-San Francisco route it originally sold to United.

▶ **Rail Intervention**—CAB has turned down the joint application of Atchison, Topeka & Santa Fe Railway Co., Burlington & Quincy Railroad Co., Chicago & Northwestern Railway Co., Rock Island & Pacific Railroad Co., Denver & Rio Grande Western Railroad Co., Union Pacific Railroad Co. and Port of New York Authority to intervene in the case. The Board claims the railroads' application was not filed in time and "that in the interest of keeping the proceeding within reasonable bounds, formal interventions have been granted only to those cities and organizations representing them which will be directly affected by the route extensions that may be authorized in the case."

▶ **Other Participants**—Before hearings conclude in Washington, examiner Moran will hear testimony from all of the major participants in the case—as well as Eastern, Frontier and Capital Airlines, which seek various interchanges and route extensions related to Denver service.

Last August, examiner Moran cut applications in the case from 17 to seven in an effort to speed up the long-hanging proceeding (AVIATION WEEK Aug. 24, 1953, p. 48). Those severed from the case will be handled separately.

AA Stresses Need For Shorthaul Liner

Sound national policy requires a substantial network of local aviation services, but the air transport industry must have efficient shorthaul aircraft to meet that need, William Littlewood, American Airlines vice president-equipment and development, believes.

Littlewood says equipment to provide local service should be neither too large nor too complex. The airplane he envisions would not be burdened with such luxuries as pressurization and higher cruising speed than necessary.

Littlewood directed his remarks to a meeting of the Society of Automotive Engineers on the West Coast recently.

▶ **Reducing Unit Cost**—Talk of a successor to the DC-3, he says, merely has been "optimistic hope that some wave of the wand would produce an airplane which would provide efficient, economical transportation for short-distance travel."

"The only way to promise substantial unit cost reductions has been to increase the size of the unit," says Littlewood. "This, of course, is a very fine method of reducing unit costs, providing bigger loads are available to be carried and a satisfactory load factor can be achieved."

However, he adds, "to serve the always-present fringe of air travel market between communities, which will continue to provide only a limited amount

of travel potential, loads in many instances must necessarily be small and the economic dangers of too large a flight unit immediately become apparent. The indicated dollar cost of such replacement units is, in many cases, far out of line with the available capital."

▶ **Opportunity**—Littlewood maintains that there is plenty of opportunity for development of satisfactory helicopters to serve vast numbers of communities without airports, as well as to provide transportation needs of metropolitan areas.

In the next 50 years, air travelers will be flying faster and higher, he says. Air transports will carry more passengers and goods more safely, more reliably, more comfortably and at a lower cost, predicts Littlewood.

Objectives to be reached before that happens, he says, are:

- Better ways and guides for getting to initial collecting and departure points.
- More efficient and effective reservations systems to handle the future loads.
- Abolishment, perhaps, of reservation systems for local travel.
- Simplified ticketing services.
- More efficient and less burdensome baggage handling and facilities.
- Better handling of passengers and their problems at airport terminals.

"It is my conviction," Littlewood says, "that as our airport activity increases and as our airplanes and passenger load units grow in size, we must separate our docked airplanes from the loading stations. There must be provided, possibly, a suitable mobile ground transportation link between the two to minimize airport foot travel distances and to cope with the increasing dockage and handling problems of more and larger airplanes."

▶ **Powerplant Question**—Long-range domestic and international transports should expect to cruise close to 600 mph. by 1965, he says, adding that this is consistent with past rates of development and appears possible with known techniques.

Whether such transports will be powered by jets, by-pass-type engines or turboprops is a question, the AA executive adds.

"I can't help expressing a great regret that there are not in this country under intensive development more suitable types of engines to power possible future transport and long-range military aircraft," Littlewood says. "Neglect of such possibilities points up a serious deficiency in our national aviation technical development program since the war."

He scores the U.S. for not having a national aviation development program "as our British cousins have had. The results have been disappointing and discouraging in this area of vaunted American superiority."

Skeds Praise ACC Policy Study

But ACTA voices strong opposition to review, calls it a 'tombstone' chiseled for nonskeds by trunklines.

General approval marks scheduled airline industry reaction to the Air Coordinating Committee's Civil Air Policy Review. But hard-hit nonskeds dissent vigorously.

"Now we know where we're headed," states one airline president, typifying attitude of the skeds.

▶ **'Men vs. Boys'**—With few dissenting, scheduled airline officials on the whole are strong in the praise of the new policy, calling it a firm stand by the Administration that will "separate the men from the boys" and "considerably lessen the subsidy burden to the U. S. taxpayer."

Several concede there are parts of the report that are not all they would like them to be, while others note that the "get tough" policy will hurt some of the smaller carriers. But there seems to be general agreement that the overall policy will be a tremendous force in strengthening the airline industry.

▶ **'Sensible Policy'**—American Airlines' president C. R. Smith makes this typical statement: "ACC has performed a great public service in preparing a most sensible consensus of government policy in the field of air transportation.

"Whether you agree with each and all of the specific objectives, it is difficult to conclude other than that U. S. aviation and the U. S. will be substantially benefited by this monumental accomplishment."

Smith also says the government's objectives with regard to air transportation now are perfectly clear, a situation that never has really existed in the history of the airline industry.

W. A. Patterson, United Air Lines president, told AVIATION WEEK that in general he felt the report was constructive and would advance commercial aviation. He referred especially to proposed policy toward nonscheduled air carriers.

▶ **'Common Sense'**—On the international side, Pan American World Airways' executive vice president, Samuel F. Pryor, Jr., calls the report the "most common sense approach to air transportation problems that has come from government in many years.

Pryor notes that it is "most timely" due to increased competition in all parts of the world.

The all-freight picture looks good, too, in the eyes of Seaboard & Western Airlines. Commenting on the report, Seaboard president Raymond A. Norden says it "provides a solid foundation for the immediate as well as long-range growth of the international air cargo industry on an economically sound basis."

Norden adds that implementation of the four-point air cargo portion of the program would "impart to the industry a stability and security which would provide economic benefits to the taxpayer as well as to the shipping public."

▶ **Nonsked 'Tombstone'**—The only strong dissenting voice in the industry is that of the Air Coach Transport Assn., taking issue with the strict policy advocated for nonscheduled airlines.

Noting the widespread use of the term "milestone in the history of aviation" when referring to the report, ACTA calls it a "tombstone with an epitaph for little business chiseled deep by henchmen of the big trunklines."

The organization holds that nonskeds are slapped with hostile statements concerning route-type service and sale of tickets to individuals.

▶ **CAB Position**—ACTA emphasizes that Civil Aeronautics Board abstained from taking part in the nonsked section of the report so as not to pre-judge pending cases, such as the large irregular carrier investigation.

Indications are, however, that CAB also will have to revise its position on many major issues and adjust its thinking on others. Observers feel that Board members will "think twice" before going against established administration policy, especially when they think in terms of reappointment. —FS

ALPA Asks Revision Of CAB Crash Report

Air Line Pilots Assn. has petitioned Civil Aeronautics Board to reconsider the evidence obtained in the investigation of the crash of a Pan American World Airways DC-4 off San Juan, P. R., Apr. 11, 1952 (AVIATION WEEK Apr. 21, 1952, p. 14).

The Board, in its final report Sept. 23, 1952, criticized the technique of Capt. John C. Burn, pilot of the aircraft.

▶ **Desk Quarterbacks**—Criticism of the pilot is not sustained by the record, ALPA maintains. The union is requesting either reconsideration and revision of the CAB's report or an opportunity for oral argument of the case.

"It is one thing to be the pilot in command, making almost instant decisions in a dire emergency and executing these decisions with machine-like precision," the union says.

"It is quite another thing for a group

with limited piloting experience to quarterback the pilot's actions from the comfort of their desk chairs, reading the impersonal record of such happening."

►**Persistent Action**—Investigators found one cause of the crash, in which 52 persons died, to be "the persistent action of the captain in attempting to re-establish a climb without using all available power, following the critical loss of power to another engine.

"This resulted," the report says, "in a nose-high attitude, progressive loss of air speed and the settling of the aircraft at too low an altitude to effect recovery."

►**Undeveloped Facts?**—Citing various sections of Pan American's DC-4 operational manual, ALPA proposes to prove Burn did all he could to save his aircraft.

"In arriving at its conclusions with respect to the probable cause of the accident . . .," says ALPA, "Nothing in the Board's report would indicate that it took into account the problem of fuel flow or temperature and humidity accountability." However, the organization adds, "it is commonly acknowledged that these factors often account for lack of horsepower availability."

The captain followed all recommended procedures promptly and correctly, the union maintains. It is "capricious for the Board to fasten this stigma upon Capt. Burn in the face of facts left entirely undeveloped by its investigation."

CAB ORDERS

(May 20-26)

APPROVED:

Discussions between American Airlines and Trans World Airlines and other air carriers of a proposed contract to be entered into with Air Force to govern participation in the Civil Reserve Air Fleet.

Intercompany agreements between Capital Airlines and Allegheny Airlines and various other air carriers.

Mail vote of Traffic Conference 2 of the International Air Transport Assn. relating to agreements between Pan American World Airways and various other air carriers on first-class and aircoach fares to points in Central Africa and the northern United Kingdom and Stavanger, Norway.

DISAPPROVED:

Fare changes proposed by Pan American World Airways and various other air carriers for Brazilian service as adopted by mail vote of Traffic Conference 1 of IATA.

GRANTED:

Central Airlines permission to omit service at Woodward, Okla.

Braniff Airways a 90-day exemption to provide free transportation on a maximum of 10 flights for Gordon Oviatt, a Lear, Inc., engineer, for the purpose of inflight observation, testing and adjusting of the Lear L-5 autopilot installed on Convair aircraft.

Seaboard & Western Airlines an exemption to permit transport of a student on a cargo flight from New York to Frankfurt and return to gather thesis material.

Frontier Airlines and Continental Air Lines permission to serve Pueblo, Colo., beginning June 1 through regular use of Pueblo Municipal Airport No. 2.

ORDERED:

An investigation to determine whether Alaska Airlines' proposed rates, charges, and provisions on airplane engines, instruments and parts from Fairbanks to Seattle are unjust, unreasonable, or unduly prejudicial.

An investigation of Northern Consolidated Airlines' proposal to establish group vacation fares between points in Alaska.

DENIED:

American Airlines' application to serve Niagara Falls, N. Y., through Buffalo Municipal Airport.

(May 27-June 3)

DENIED

Application of Greensboro-High **Point** (N. C.) Airport Authority requesting the two cities be included in the group of midway cities selected by CAB for special consideration as to their service needs to and from northeastern cities and the Oklahoma-Texas-Louisiana cities involved in the additional Southwest-Northeast service case.

Acme Air Cargo's petition to intervene in the application of Tuya Cuban Express Corp. for a foreign air carrier permit authorizing indirect air transportation from and to points in the U. S. and Havana, Cuba.

United Air Lines' application for temporary exemption to permit scheduled nonstop air service for persons, property and mail between Portland, Ore., and Chicago.

GRANTED:

Flying Tiger Line an exemption to permit operation of one flight from Brussels, Belgium, to New York, June 1.

Pioneer Air Lines authority to omit service at Big Spring, Snyder and Sweetwater, Tex., on all flights operated between Midland-Odessa and Abilene, Tex., in excess of two roundtrips daily, provided that any flight operated between Midland-Odessa and Ft. Worth or Dallas shall serve Abilene and one other city as intermediate points.

Seaboard & Western Airlines exemption to permit one roundtrip flight between New York and Beirut, Lebanon, for a group of Roman Catholic pilgrims.

Edgar A. Stewart, doing business as Stewart Air Service, an exemption to enable the line to operate one flight from Los Angeles to Nanaimo, B. C., Canada.

Alaska Airlines temporary exemption to enable the carrier to serve Andreafski, Alaska, as an intermediate point between Pitkas Point and Mountain Village on its Bethel-Unalakleet route until 60 days after CAB's final decision on Alaska's application for amendment of its certificate to include Andreafski.

Mohawk Airlines permission to use Grossinger Airport in serving Liberty-Monticello, N. Y.

Pan American-Grace Airways temporary exemption to serve La Paz, Bolivia, and either or both Antofagasta and Santiago, Chile, on the same flight for one year.

Greensboro-High Point (N. C.) Airport Authority, Memphis chamber of commerce, Tennessee Bureau of Aeronautics and city and chamber of commerce of Jackson, Miss., leave to intervene in the additional Southwest-Northeast service case.

Transocean Air Lines exemption to permit it to operate one roundtrip between New York and Beirut, Lebanon, July 1.

APPROVED:

Intercompany agreements between American Airlines and Continental Air Lines and various other air carriers.

Agreement filed by Delta, Braniff, National, Pan American and various foreign airlines relating to the articles of association of the Air Transport Assn. of Cuba.

DEFERRED:

Until Sept. 1, action on Braniff Airways request for temporary suspension of service at Norfolk, Neb., until June 30, 1956.

Until after Aug. 15, action on **Braniff's** application for temporary suspension of service at Austin-Albert Lea and Owatonna-Faribault-Waseca, Minn., for the duration of its temporary authorization to serve them.

Until Sept. 1, **Braniff's** application for temporary suspension of service between Sioux Falls, S. D., and Fargo, N. D., via the intermediate points Brookings and Watertown, S. D., until June 30, 1956.

AUTHORIZED:

Braniff Airways to suspend service temporarily at Ponca City, Okla., and Topeka, Kan.; to suspend service temporarily at Galveston, Tex., until 60 days after final decision in renewal proceedings of the temporary certificate of Trans-Texas Airways.

Pan American-Grace Airways temporary suspension of service at Chiclayo, Peru, and at Salta, Argentina.

SUSPENDED:

Letters of registration of Coastal Cargo Co., Monarch Air Service and World Wide Airlines, effective June 12, unless the three carriers file delinquent reports with the Board before June 11.

Individual exemption of Currey Air Transport as an irregular carrier effective June 12 unless Currey has filed its delinquent reports with CAB by June 11.

Letters of registration of International Air Cargo Express effective June 18 unless the airfreight forwarder files financial statements due before June 17.

ORDERED:

Investigation to determine if Pan American World Airways' roundtrip charter charge of $6,038 for DC-4 aircraft between San Francisco and Naknok, Alaska, will be unjust or unreasonable.

Reopening of current final mail rate for Colonial Airlines' Bermuda operations.

AMENDED:

North Central Airlines' temporary exemption to provide service between Chicago and Duluth, Minn., by deleting Green Bay, Wis.

Flying Tiger Line's temporary exemption to transport farm laborers between the U. S. and British West Indies by adding British Guiana and British Honduras to the route.

CONSOLIDATED:

Various Board reports, petitions and applications in Trans-Texas Airways' application for renewal of its temporary certificate.

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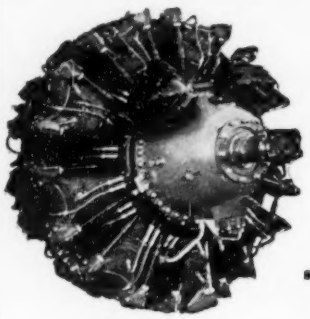

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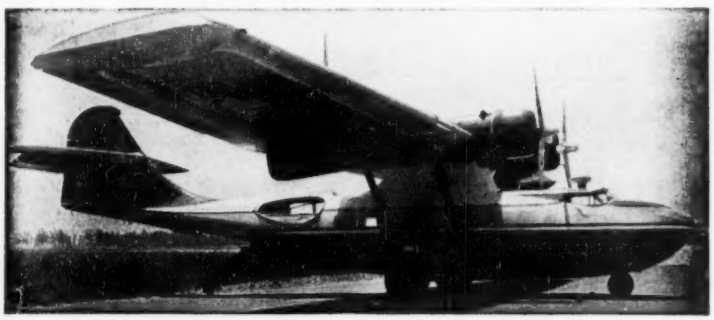

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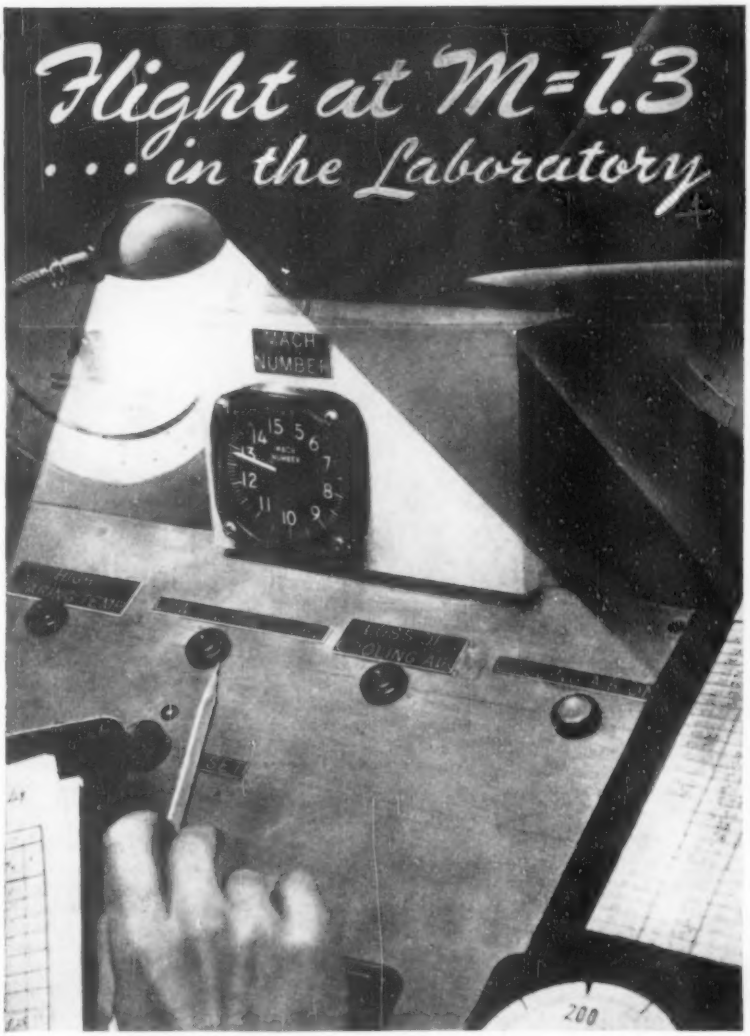

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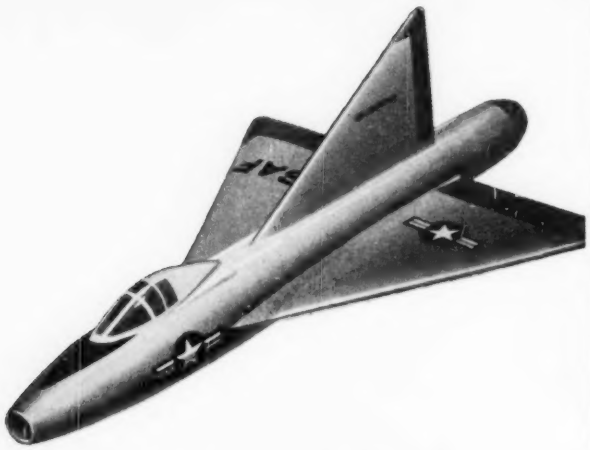

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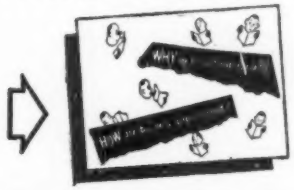

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Convair's widely-publicized XFY-1 . . . the new Convair delta wing vertical take-off plane designed, engineered and built in San Diego.

News Sidelights

June 10 was the 10th anniversary of the first flight of the Lockheed F-80, first U. S. production jet fighter.

The FU-24, Fletcher Aviation Corp.'s new agricultural plane, will make its first flight this month. The 40-ft., tricycle gear, all-metal airplane can be used for cargo, ambulance or for passenger service at very small airports.

Tests have been completed on the tiny Payen P.A.49 delta-wing project in France and it is slated to be returned to the manufacturer, where it reportedly will be fitted with flaps and retractable landing gear.

First engineering students have graduated from Boston University's College of Industrial Technology, Logan International Airport. All five graduates received aeronautical engineering degrees.

The first Bell helicopter purchased by Helicopter Air Service, Inc., Chicago, a Model 47D, has completed 5,000 hr. of accident-free flight in almost five years of continuous airmail service, the operator reports. Five other HAS copters have logged more than 4,500 hr. each.

A stratospheric glider with a design ceiling of 52,500 ft. and maximum speed of 217 mph. in level flight is being built in France by Breguet. The craft, to be used for high-altitude research as well as sports flying, will span 79 ft.

Tactical Air Command has received its first Republic F-84F Thunderstreaks, the third USAF command to get the sweptwing fighter-bombers. Others were Strategic and Air Training Commands. The tactical unit is the first to get Thunderstreaks with the "slab" one-piece horizontal tail.

A "poor man's" helicopter, aimed at a $560 price-tag if produced in quantity, is being tested in England by John Murray, Salford, Lancashire. Murray received permission from the Ministry of Civil Aviation to conduct tethered tests on his craft as long as he does not take it higher than 10 ft. from the ground. The copter reputedly cost $2,800 to build and its designer says several European firms have expressed interest in it.

A helicopter flight simulator, which reportedly can reproduce the actual performance characteristics of any existing or proposed rotorcraft has been presented to the French Aeronautical Service. Simulator is designated the Dorand DX-50. It is said the DX-50 will enable test pilots to suggest necessary improvements in a copter design prior to flights.

Construction of heliports in Vancouver has been suggested to city officials by William Inglis, manager of Vancouver International Airport. He had been asked to prepare a report on the subject. A Trans-Canada Air Lines spokesman told AVIATION WEEK that although TCA has no definite copter plans, it sees such service between Vancouver and Victoria, Vancouver Island, as a "natural." But to make it pay, copters seating 20-32 passengers are necessary, he says.

AIRCRAFT DESIGN PROGRESS–from famed World War I Curtiss Jenny to the highspeed Douglas X-3 research plane–is portrayed in this view of the two planes exhibited during a recent "open house" at Edwards AFB Flight Test Center, Calif. The Jenny, modified to take a radial engine in place of the Curtiss inline powerplant standard for most JN's of the early period, is owned by Jack B. Hardwick of Hardwick Aircraft Co., Rosemead, Calif.

AVIATION CALENDAR

June 17-21–American Institute of Electrical Engineers, summer and Pacific general meeting, Hotel Biltmore, Los Angeles.

June 18-19–Britain's National Air Races, sponsored by Royal Aero Club, Bagington Aerodrome, Coventry, England: International Trophy Race, June 18; King's Cup Air Race, June 19.

June 20-23–Aviation Distributors & Manufacturers Assn., mid-year meeting, Stanley Hotel, Estes Park, Colo.

June 21-24–Institute of the Aeronautical Sciences, annual summer meeting, IAS Building, Los Angeles.

June 23-25–Symposium on Global Communications, sponsored by Institute of Radio Engineers, Statler Hotel, Washington, D. C.

June 24-26–American Helicopter Society, 10th annual forum, Washington, D. C.

July 3-6–Eighth annual All Women Transcontinental Air Race, sponsored by Ninety-Nines, Inc., Long Beach, Calif., to Knoxville, Tenn.

July 3-11–Philadelphia Glider Council, annual Open House Week; Glider Training Camp, June 11-17; both at Hilltown, (Pa.) Gliderport.

July 4–Western National Air Show & Races, including closed-course midget racer events, sanctioned by National Aeronautic Assn., Dansville, N. Y.

July 13-15–Western Plant Maintenance Show, to be managed by Clapp & Poliak, at the Pan-Pacific Auditorium in Los Angeles.

July 22–Third National Aviation Education Workshop, sponsored by CAP and the University of Colorado, Boulder, Colo.

July 27-Aug. 5–21st National Soaring Contest, Elsinore, Calif.

Aug. 7-8–Experimental Aircraft Assn., fourth annual National Air Pageant and second annual fly-in and convention, featuring "home-built" aircraft, sportsplanes, racers and antiques, Milwaukee.

Aug. 9-10–American Society for Quality Control, first annual Western Regional Conference, to be held in conjunction with the National Conference of the Aircraft Technical Committee, U. S. Grant Hotel, San Diego.

Aug. 9-11–Institute of the Aeronautical Sciences, turbine-powered air transportation meeting, Seattle.

Aug. 25-27–Western Electronic Show & Convention (WESCON), sponsored by West Coast Electronics Mfg. Assn. and Institute of Radio Engineers, Ambassador Hotel, Los Angeles.

Sept. 4-6–National Aircraft Show, Dayton, Ohio.

Sept. 13-24–Instrument Society of America, first International Instrument Congress and Exposition and third annual Analytical Instrument Clinic, Philadelphia.

Sept. 21-23–Society for Experimental Stress Analysis, annual meeting and exhibition, Bellevue-Stratford Hotel, Philadelphia.

Oct. 4-6–Tenth annual National Electronics Conference, Hotel Sherman, Chicago.

Oct. 17-22–International Union of Aviation Insurers, annual general meeting, New York.

Oct. 18-22–National Safety Council, Aeronautical Section, Conrad Hilton Hotel, Chicago.

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AVIATION ENGINEERING DIV., AVIEN-KNICKERBOCKER CORP. 81
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BALMAR CORP. FRANKLIN 38
Agency—Emery Advertising Corp.
BEECH AIRCRAFT CORP 72
Agency—Associated Adv. Agency, Inc.
BENDIX RADIO DIV., BENDIX AVIATION CORP. 65
Agency—MacManus, John & Adams, Inc.

CAMAIR DIV. OF CAMERON IRON WORKS 56
Agency—Boone & Cummings
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Agency—Dwyer & Devoy Adv.
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DELRON CO., INC. 26
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EX-CELL-O CORPORATION 37
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Agency—Gaynor & Co., Inc.
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Agency—G. M. Basford Co.

GENERAL ELECTRIC CO., CHEMICAL DEPT 25
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GENERAL TIRE & RUBBER CO. (INDUSTRIAL PRODS. DIV.) 74
Agency—D'Arcy Advertising Co.
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Agency—Batten, Barton, Durstine & Osborn, Inc.
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Agency—E. M. Freystadt Associates
KOCH & SONS., H. 44
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Agency—Hal Stebbins Agency

MACWHYTE COMPANY 10
Agency—Needham, Louis & Brorby, Inc.
MAXSON CORP., THE W. L. ..... Fourth Cover
Agency—Engineered Advertising
M B MFG. CO., INC., THE 27
Agency—Rickard & Co., Inc.
McCAULEY INDUSTRIAL CORP. 50
Agency—Hugo Wagensell & Assoc.

NEW YORK AIR BRAKE CO., THE 23
Agency—Humbert & Jones Adv.
NYLOK CORPORATION, INC. 82
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PACIFIC SCIENTIFIC CO 24
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SEARCHLIGHT SECTION 97, 98, 99, 100, 101, 102
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Agency—Burke Dowling Adams, Inc.
SORTING CONTRACTORS, INC. 34
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Agency—Geyer Advertising, Inc.
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Agency—Gaynor & Co., Inc.
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For Sale 97-98
WANTED
Planes-Equipment 98

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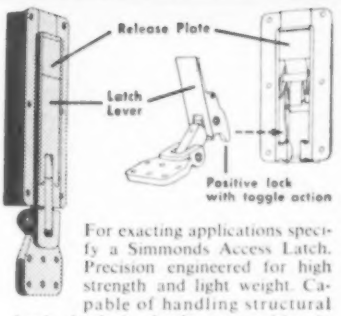

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EDITORIAL

British Deliver the Goods!

Capital Airlines promises British-built turbo-propeller transports in regular service by next spring.

Pan American Airways is standing by its order, announced months ago, for British-built Comets.

A fleet of British-built de Havilland Doves is flying in this country as executive aircraft, and their numbers are increasing.

Such an invasion of British products would have been unthinkable to most U. S. commercial aviation people a short time ago.

One of the reasons for this unheard-of state of affairs is our lack of a national aviation development program, as William Littlewood points out.

Another is that the very dominance of military orders, whose myriads of billions of dollars have put us so far ahead of the rest of the world in military aviation and research, have deprived non-military aviation of its share of attention, research and efficient aircraft.

We have no feeder airliner. We have no medium-range successor to the DC-3. We have one type in the 300-mph. range, specifically designed for the executive aircraft market, and it is based on an earlier design. We have further to go in economical cargo aircraft, both fast and medium speeds. We have no standard agricultural plane. Our lightplanes are improving but we are told there is enough research data in the files to revolutionize lightplane design if anyone wanted to do it badly enough.

By our own inaction, how many more projects will we leave to the British to deliver the goods?

Heinemann's Bantam Bomber

"Finally, someone had the courage to go out and do something about simplicity instead of merely talking about it," one of our engineering editors remarked as he studied the first photograph of the A4D Skyhawk.

In this case, the Navy's Bureau of Aeronautics, Douglas Aircraft Co., and its El Segundo Division chief engineer, Ed Heinemann, deserve the laurels for a bold break with recent tradition.

This remarkable-appearing midget attack plane, described elsewhere in this issue, reverses the discouraging onward march of ever more complexity, weight and cost of modern fighting aircraft that has brought increasing consternation to a few thoughtful men in aviation since the end of the war. No one has been more outspoken about the trend than Ed Heinemann, some of whose militant outbursts were published on this page.

A glance at first photographs released by the Navy indicates that this bantam bomber, nicknamed Heinemann's Hot Rod, must have every engineering trick in the trade under its skin. It will need most of them to enable enough fuel to be stowed aboard for a coast-to-coast nonstop flight, which is reported to be one of its design requirements.

Regardless of how tests come out—and we learn from every one of them—the Navy, Douglas, and Heinemann deserve our plaudits for daring to simplify the modern military airplane, and doing it in a big way! They may very well be opening a new era in design, production and utilization of high-performance, lightweight jet attack planes, bringing significant military and industrial changes, as well.

Voluntary Censorship

For the second time, AVIATION WEEK has invoked self-censorship involving a major development of a sensitive security nature. The latest ban has been in effect since Apr. 15, and will continue until further notice.

AVIATION WEEK initiated a 60-day experiment in a similar limited, voluntary censorship late in 1951, involving the Boeing inter-continental B-52 bomber. This period was extended until the middle of 1952, when more official information about the big plane was released, and Life magazine appeared with other, uncleared information.

The earlier experiment was made in cooperation with Secretary Finletter and the Air Force, after Mr. Finletter made a special appeal to the press to help keep unauthorized information about the B-52 "from any potential enemy as long as possible." AVIATION WEEK was then the only publication which adopted its own voluntary censorship policy, and for the period published only cleared or officially released data on the B-52.

In the current matter, we are withholding from publication any reference to what informed aeronautical research officials assure us is a discovery that appears to have important possibilities for improving performance of certain types of military aircraft.

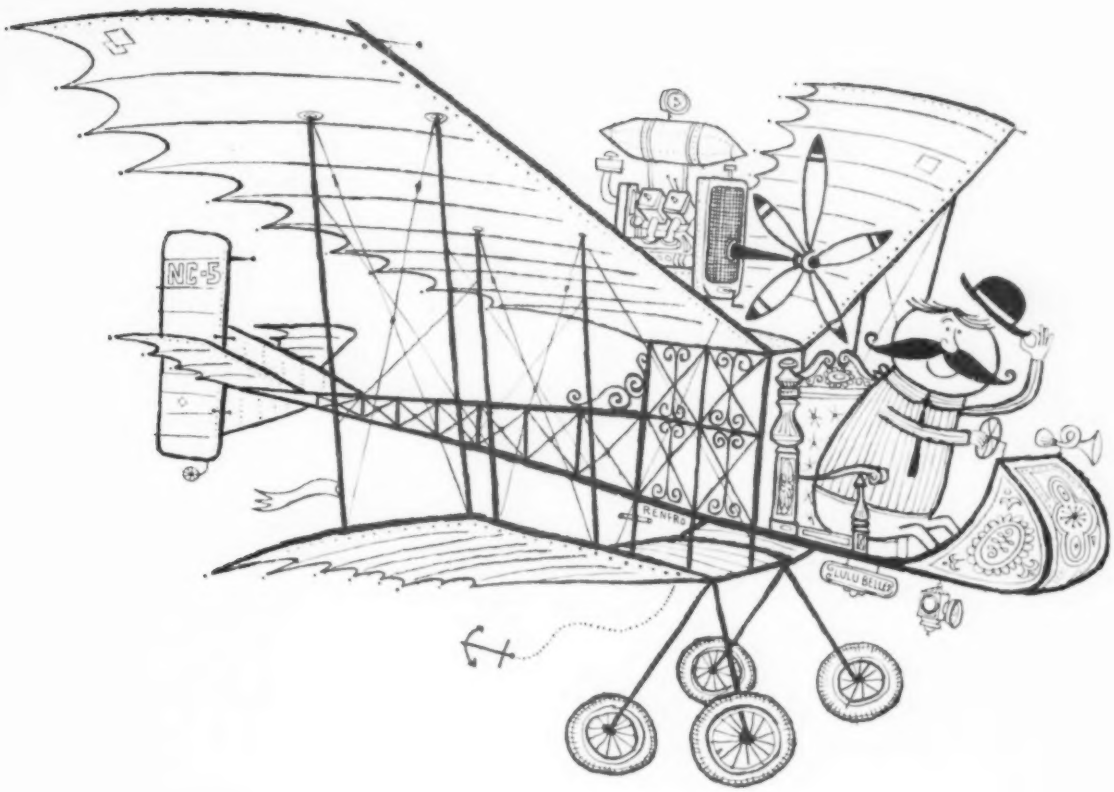
In fact, we are assured, the matter represents a major military and scientific secret. It is generally recognized that gradual, piecemeal revelation, at least, of the development is only a matter of time, but these officials tell AVIATION WEEK that every day that news of this discovery can be kept out of unfriendly hands is important. They are not the kind of men to cry "wolf" when no major security problem exists.

As our readers know, this magazine has fought all of its life against unnecessary news suppression and secrecy. It believes in an enlightened public. In a democratic way of life a well-informed public must and should have access to many facts which would be denied the citizens of a dictatorship. There are times when it is more important to inform our own people than to deny them information on the grounds that such information also reaches unfriendly powers.

Unnecessary secrecy and improper controls, however, inevitably lead to abuse of power, waste and inefficiency.

Nevertheless, we concede that occasionally there is a matter of unusual importance which should not be publicized for brief periods, at least, in the national interest. The current subject, we believe, is one of those.

—Robert H. Wood



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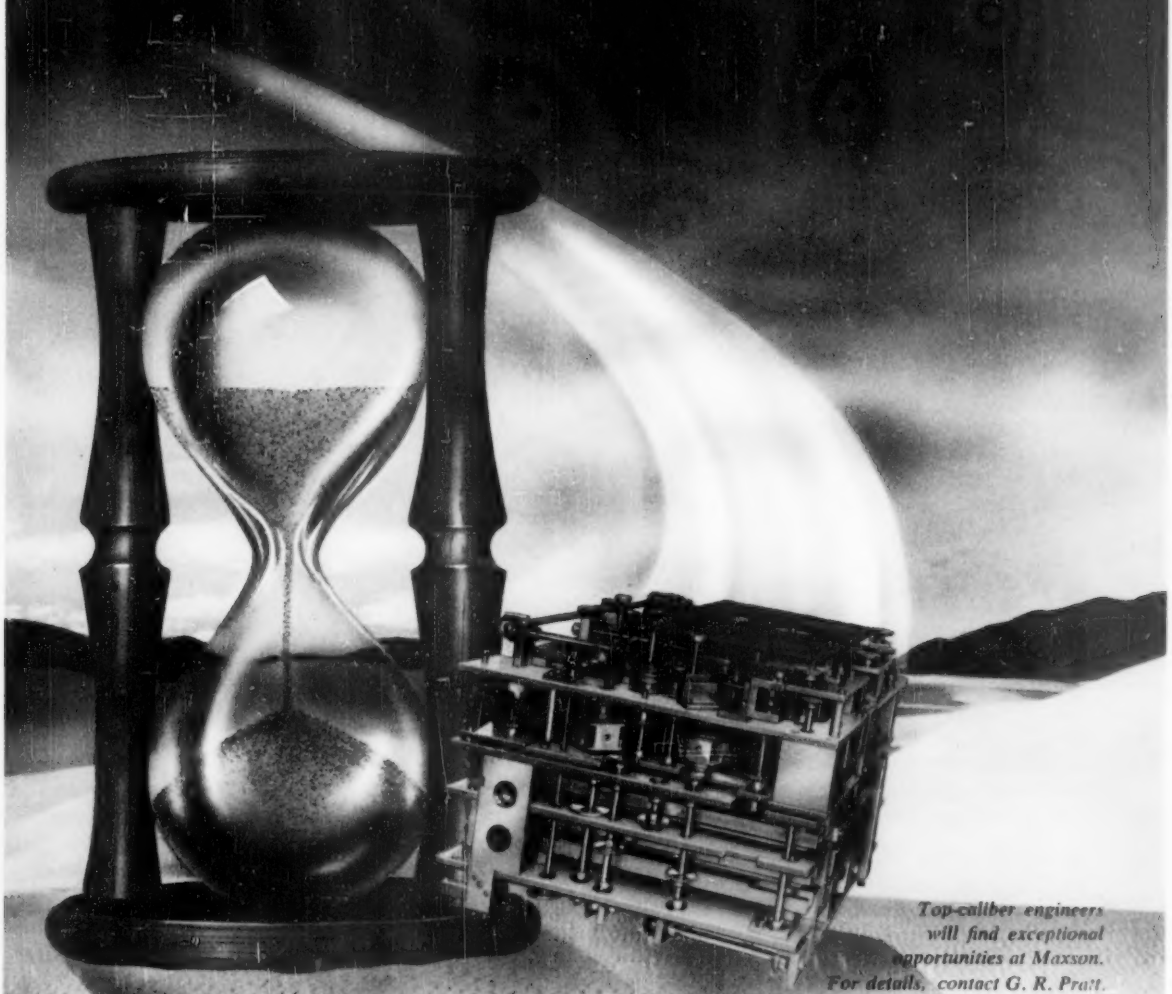

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